



Clarifying Economic Justifications for Government Intervention to Assist Agricultural Adaptation to Climate Change

Practice Change Working Paper 02 / 09

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Executive summary

Climate change is a relatively new and rapidly evolving policy issue. The Victorian Government is contributing to global efforts to identify what climate changes are likely to occur and to develop policies that address their impacts. Primary industries are likely to be particularly vulnerable to the impacts of climate change. The future prosperity of Victoria's primary industries will depend on their capacity to adapt to the impacts of changes in the state's climate, such as increasing temperature, lower rainfall and increasing frequency of extreme events. It will also depend on their capacity to adapt to broader trade and policy impacts of climate change, such as rising prices for inputs, changing competition in markets for agricultural products and the move towards a low carbon economy.

In recognition of these challenges, a policy objective of the Victorian Government is to assist primary industries to adapt to climate change. To this end, the Victorian Government's Climate Change Adaptation Program (VCCAP) and the Department of Primary Industries (DPI) have developed a research program 'DPI VCCAP.' The research reported here is part of the DPI VCCAP research program.

The aim in this research was to support the Victorian Government in its efforts to identify appropriate policy responses by clarifying the fundamental economic conditions that may justify government intervention to assist primary industries to adapt to climate change. Some policy instruments will be more efficient than others in delivering on this objective, depending on which conditions are present. The framework that we used to clarify the fundamental economic conditions that may justify government intervention is a component of a larger suite of conceptual frameworks known as the Policy Choice Framework.

In this report, we briefly outline the Policy Choice Framework. We then describe the first component framework, the economic justification framework. Next, we provide some examples to show how this framework can be used to clarify the fundamental economic conditions that may justify government intervention to assist primary industries to adapt to climate change.

We showed how the efforts of primary producers to adapt to climate change could potentially lead to:

1. A decline in the incomes of primary producers below a threshold that is acceptable to the broader community. This may justify government intervention on the grounds of inequalities in income distribution.
2. Significant changes in the social costs and benefits created in the production or consumption of agricultural commodities. This may justify government intervention on the grounds of missing or incomplete markets. Examples provided included:
 - increases in social costs as a result of incomplete markets in the capacity of the environment to assimilate nutrients, an ecosystem service;
 - declines in social benefits as a result of incomplete markets in labour and technology; and
 - declines in social benefits as a result of missing markets in some types of technology (i.e. technology that is non-exclusive in production and non-rival in consumption).

The presence of such conditions would be necessary, though not sufficient, to justify government intervention. For intervention to be justified it is also necessary to establish that the social benefits of the chosen intervention are likely to outweigh its anticipated costs.

The findings illustrate how a number of conditions may potentially justify government intervention to assist primary industries to adapt to climate change. The findings also highlight the importance of distinguishing inequalities in income distribution from conditions that lead to market failure. With respect to the latter, the findings underscore the importance of identifying which condition(s) are present and precisely which markets they are present in, if efficient interventions are to be identified. These findings are intended to be illustrative rather than comprehensive or definitive.

1.0 Introduction

It is now generally accepted that global climate change is a reality that is likely to have significant impacts on Australia. The Commonwealth Government has identified agriculture as one of the five industry sectors most vulnerable to climate change.¹ The Victorian Government has also identified agriculture as one of the state's most vulnerable sectors and systems.² The future prosperity of Victoria's primary industries will depend on their capacity to adapt to the impacts of changes in the state's climate, such as increasing temperature, lower rainfall and increasing frequency of extreme events (Intergovernmental Panel on Climate Change 2007). It will also depend on their capacity to adapt to broader trade and policy impacts of climate change, such as rising prices for inputs, changing competition in markets for agricultural products and the move towards a low carbon economy (Stern 2007; Garnaut 2008; Victorian Government Department of Premier and Cabinet 2008).

1.1 The Victorian Climate Change Adaptation Program (VCCAP)

In recognition of these challenges, a policy objective of the Victorian Government is to assist primary industries to adapt to climate change. To this end, the Victorian Government's Climate Change Adaptation Program (VCCAP) and the Department of Primary Industries (DPI) have developed a research program, DPI VCCAP. The aim in this research program is to increase the knowledge and capabilities of government, the agriculture sector and farming businesses to undertake sound and informed planning and policy decisions that maximise the benefits and minimise the economic, social and environmental costs of climate change.

The research in the program takes a whole of government approach and is guided by four key questions:

1. What are the impacts of climate change on agriculture in regional Victoria?

¹ Along with forestry, fisheries, infrastructure and tourism (The Department of Prime Minister and Cabinet 2002).

² along with natural resources and biodiversity, water, coasts, manufacturing, energy, tourism, health and landuse planning, buildings and infrastructure (Victorian Government Department of Premier and Cabinet 2008).

2. What are the climate change adaptation options and likely responses of/for primary industries in regional Victoria?
3. What are appropriate government policy responses to assist primary industries to adapt to climate change?
4. How do we ensure effective communication and utilisation of the information developed by DPI VCCAP?

These questions are addressed through six research themes:

- farming system scenario development;
- communication and utilisation;
- impact modelling and land suitability analysis;
- institutional adaptation;
- visualisation and e-resource centre; and
- policy research.

This report presents some of the findings of the policy research theme.

1.2 The policy research theme

The focus of the policy research theme was on the third question above for DPI VCCAP. Specifically, the intention in the policy research theme was to contribute to the Victorian Government's efforts to identify effective and least cost, that is, efficient, policy responses to assist primary industries to adapt to climate change. This will be critical to ensuring that the greatest possible benefits are derived from the investment that the Government makes to deliver on this policy objective.

Therefore, a key aim in the policy research theme was to continue to develop a Policy Choice Framework (Kaine, Ford, Leth and Johnson 2007) for systematically and transparently identifying efficient policy instruments to deliver on a policy objective, such as assisting primary industries to adapt to climate change. Another aim was to illustrate how the Framework could be used to help policy makers to choose a package of policy instruments to assist primary industries to adapt to climate change.

1.3 Report objectives and outline

The objective in this report is to use the first component of the Policy Choice Framework to clarify some economic conditions that may justify government intervention to assist primary industries to adapt to climate change. Some policy instruments will be more efficient than others in delivering on this objective, depending on the conditions that are present.

In the next section of the report, we outline the Policy Choice Framework. We then describe the first component framework, the economic justification framework. Next, we use some illustrative examples to show how this framework can be used to clarify some economic conditions that may justify government intervention to assist primary industries to adapt to climate change. Thus, the analysis is intended to be illustrative rather than comprehensive.

In the concluding section the implications of the findings for identifying efficient policy responses are drawn together.

2.0 Outline of the Policy Choice Framework

The Policy Choice Framework (PCF) was developed to help policy makers choose policy instruments to efficiently deliver on a policy objective when delivering on the objective depends on changing the behaviour of primary producers.³ Because the adaptation of primary industries to climate change will depend on the behaviour of primary producers, the Policy Choice Framework should prove useful in helping policy makers to choose policy instruments to efficiently deliver on the policy objective of assisting primary industries to adapt to climate change.

The Policy Choice Framework draws together ideas from adoption, compliance, organisational and economic research to systematically identify issues that will critically influence how efficient alternative policy instruments are likely to be in delivering on a

³ Policy instruments are the mechanisms that governments use to influence behaviour, such as regulations, education programs, basic research, technology development and financial incentives.

policy objective. Policy instruments can then be evaluated and chosen in light of these issues. The Framework is intended to supplement other available methods of policy analysis and instrument choice and, therefore is not intended to be exhaustive or definitive.

Developing the Policy Choice Framework has been an exercise in continuous improvement. Therefore, the Framework has evolved in light of experience and will continue to evolve as gaps in the issues it addresses are identified. The structure of the Policy Choice Framework is summarised in Figure 1. From the figure it can be seen that the Framework has seven components. Although the components are ordered sequentially, there are feedback loops between them that support an iterative approach to evaluating alternative policy instruments as critical issues are identified.

The components of the Policy Choice Framework that will be brought to bear on any given policy objective will vary, depending on the critical issues that are identified and the extent to which tangible policy options have been developed for consideration. In this report, the first component has been brought to bear on the policy objective of assisting primary industries to adapt to climate change.

From Figure 1, it can be seen that Components 1 and 2 of the Policy Choice Framework (in green) are used to identify a primary instrument. Generally, a package of instruments will be required to deliver on a policy objective. This package will consist of a main instrument, which will be the main driver of change, and some supporting instruments. To illustrate, a package of instruments will be used to deliver on the policy objective of mitigating greenhouse gas emissions in Australia. In this package, the main instrument is the Carbon Pollution Reduction Scheme, which is a cap and trade market (Australian Government 2008; Garnaut 2008). Supporting instruments will include research, incentives and education.

Component 1 is used to clarify some economic conditions that may justify government intervention. Some policy instruments will be more efficient than others in delivering on an objective, depending on which conditions are present. Component 2 is used to identify which instruments are technically feasible. At this point particular instruments may be eliminated from consideration because they are not technically feasible.

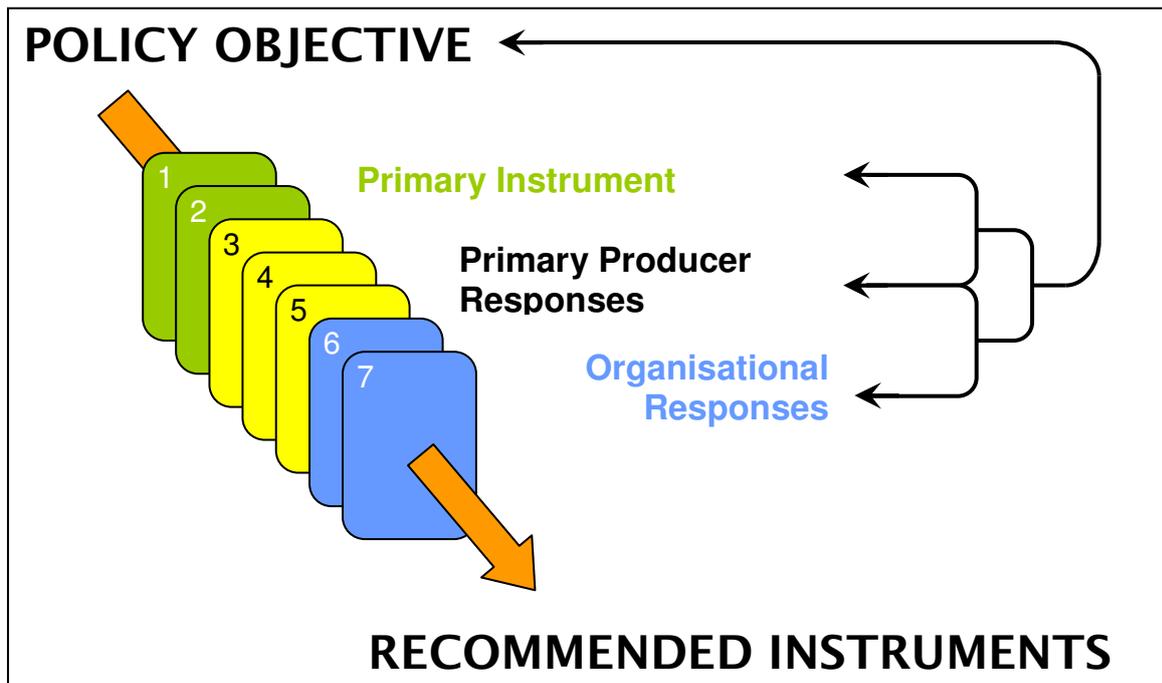


Figure 1 The Policy Choice Framework (PCF)

Components 3, 4 and 5 of the Framework (yellow in Figure 1), are used to predict the responses of primary producers to policy instruments that have been identified as technically feasible. In Component 3, the responses of primary producers to these policy instruments are predicted on the basis of their involvement with the policy issue and the instrument itself. In Component 4, the potential for primary producers to comply with these policy instruments in ways that are counter-productive to the policy objective are assessed. In Component 5, the potential for policy instruments to change the behaviour of primary producers on the scale, and rate that is required is evaluated. Components 3, 4 and 5 provide an opportunity to refine or supplement the policy instruments under consideration to account for the likely responses of primary producers.

Components 6 and 7 of the Framework (blue in Figure 1) are used to predict how the organisations responsible for implementing government policies are likely to respond to the policy instruments under consideration. In Component 6, the policy instruments under consideration are compared with those already in place. If there are large differences in the features of these instruments then successful implementation may require significant changes in the way that the organisations responsible operate. In Component 7, factors that influence relationships among responsible organisations are examined. Components 6 and 7 provide an opportunity to refine or supplement the instruments under consideration to account for the likely responses of responsible organisations.

In this report, we use Component 1 of the Policy Choice Framework to clarify possible economic justifications for government intervention to assist primary industries to adapt to climate change. Detailed descriptions of components 3 through to 7 are provided in the Appendix.

3.0 Economic justifications for government intervention

3.1 Introduction

In economics it is recognised that, while the free operation of competitive markets is ideal, in practice, the presence of some conditions may justify government intervention to enhance social welfare. A combination of these conditions may be present in any given situation. The forms of government intervention and, therefore, the appropriate choice of policy instruments, will depend on which conditions are present. Thus, the aim in Component 1 of the Policy Choice Framework is to consider whether one or more of these conditions may be present so that they can be taken into account in choosing policy instruments.

In this section, we outline four fundamental conditions that, according to economics, may justify government intervention. These conditions are described as inequalities in income distribution, missing markets, incomplete markets and imperfect markets. The logic that is used to identify which combination of conditions is present in a given situation is summarised in Figure 2. From an economic perspective, each condition provides a necessary, though not sufficient, justification for government intervention. For intervention to be economically justified it is also necessary to establish that the social benefits of the chosen intervention are likely to outweigh its costs (Jones 1994; Belli 1997; Stern 2007; Garnaut 2008)).

If it is not possible to identify one or more condition(s) that may justify government intervention on economic grounds, economics would suggest that the appropriate course of action is to ensure that the policy objective is clearly specified (regardless of the grounds on which it may be justified) and pursued as efficiently as possible (Rama and Harvey 2009). Under these circumstances the remaining seven components can assist in identifying policy instruments that will ensure the policy objective is pursued as efficiently as possible.

We begin by distinguishing inequalities in income distribution from the other three conditions, which concern the production or consumption of specific products or

services at levels that are not socially optimal. This distinction is critical because it reflects a distinction in the role of economics (Rhoads 1985; Productivity Commission 2001; Productivity Commission 2009). With regard to inequalities in income distribution, economics does not offer guidance as to what income distribution would be socially optimal. However, if an optimal distribution has been identified then economics offers guidance as to the most efficient way to achieve such a distribution. In contrast, when specific products or services are being produced at levels that are not socially optimal, economics offers guidance as to what levels would be socially optimal and the most efficient way to achieve them.

Having distinguished inequalities in income distribution from the other three conditions, we then explain how government intervention to address inequalities in income distribution can enhance social welfare.⁴ In the process, we describe an economic principle for considering the form of such an intervention. However, identifying policy instruments to efficiently modify income distribution is beyond the scope of the Policy Choice Framework, which is concerned with identifying policy instruments to efficiently address the three forms of market failure described in the following sections.

Next, we discuss missing markets, incomplete markets and imperfect markets. These conditions are often described as forms of market failure, because they can lead to markets substantially and systematically failing to allocate resources to their most highly valued use (Rama and Harvey 2009). In other words, they can lead to an inefficient allocation of resources, which then results in the production or consumption of goods or services at levels that are not socially optimal.

After explaining why these conditions result in the production or consumption of goods or services at levels that are not socially optimal, we describe how government intervention to address them can enhance social welfare. Finally, we use the economic justification framework to consider which conditions may be present in relation to the policy objective of assisting primary industries to adapt to climate change.

⁴ Social welfare is a measure of the welfare of a society as a whole and is an aggregate of the welfare, or utility, experienced by all of the individuals that make up a society (Samuelson 1947; Arrow 1963a; Sen 1970). The ideal in economics is to maximise social welfare.

3.2 Economic conditions that may justify government intervention

3.2.1 When the objective is to modify income distribution

The first condition that may justify government intervention is when inequalities in income distribution are present that a society considers to be unacceptable (Jones 1994; Belli 1997). This condition is qualitatively different to the other three conditions discussed in this section because it concerns access to products and services broadly, rather than access to a specific product or service. When inequalities in income distribution are present, some consumers will have inadequate access to all of the products and services that are traded in markets, even when such markets are functioning efficiently. From Figure 2 it can be seen that if the policy objective is to modify income distribution then the objective addresses inequalities in income distribution that society considers to be unacceptable.⁵

From an economic perspective, government intervention to redress inequalities in income distribution can enhance social welfare because the welfare of society as a whole depends on the utility experienced by all of its constituents (Scitovsky 1954; Henderson and Quandt 1980). This means, for example, that an individual may experience a loss in income and still experience an increase in utility. This can occur if they experience utility from the knowledge that their loss in income will enable others in society to have a level of access to products and services that is sufficient to meet their basic needs. This example highlights how the utility experienced by individuals in society can be interdependent and, therefore, the critical role that social preferences play in judging the need to redress inequalities in income distribution.

If inequalities in income distribution are present and government intervention has the potential to enhance social welfare then economics offers a principle to guide decisions

⁵ While government interventions to deliver on various objectives will inevitably affect income distribution in society, this question is intended to represent circumstances where the justification for government intervention is to deliberately address inequalities in income distribution.

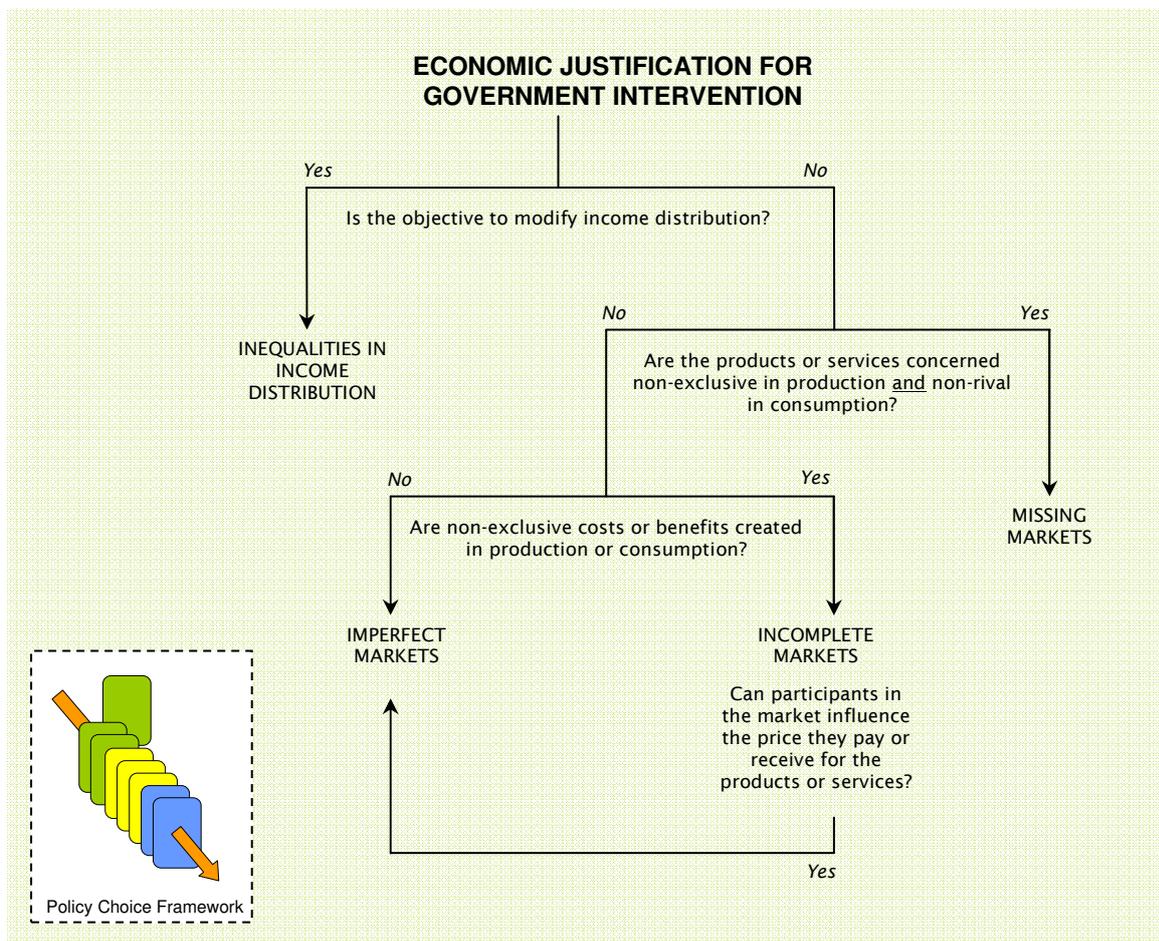


Figure 2 Economic justification tree

about the nature of government intervention. Namely, the intervention should directly address the economic condition of concern (Alston and Pardey 1996; Belli 1997).

Otherwise, the intervention may create inefficiencies in resource allocation, production and consumption that will reduce social welfare. This means that, as a general rule, to redress inequalities in income distribution, government should transfer income directly to individuals and households in need, rather than indirectly by intervening in the operation of markets. Government regulations to establish a minimum wage and government provision of welfare payments are examples of policy instruments that transfer income directly to individuals and households in need. These instruments provide individuals and households with a minimum socially acceptable level of access to products and services.

Economists often raise questions about whether government interventions directly address the economic condition of concern (Campbell and Fisher 1991; Hilmer, Raynor and Taperell 1993; Worrell, Milham and Curthoys 1998; Pannell 2001; Productivity Commission 2009). Worrell, Milham and Curthoys (1998), for example, describe how Australian Government interventions into primary industries have provided indirect welfare support to farm families. They suggest that this may have been a politically expedient response to inadequacies in the capacity of the Australian welfare system to service individuals who are self-employed. Over time, the Australian Government has introduced various instruments to provide welfare assistance directly to farm families in need, thereby directly addressing inequalities in income distribution (Worrell, Milham and Curthoys 1998; Productivity Commission 2001; Productivity Commission 2009).

At the same time, Martin (1999) shows how, in some circumstances, instruments that indirectly address inequalities in income distribution may lead to better economic outcomes than income transfers. In particular, Martin showed that income transfers to reduce inequalities in income distribution between two regions may also reduce economic growth in both regions. In contrast, he showed that public policies that reduce the cost of innovation may reduce inequalities in income distribution and increase economic growth in both regions.

Martin's (1999) findings are consistent with Alston and Pardey's (1996) argument that government investment in agricultural research and development has the potential to increase the net income of society as a whole as well as that of primary producers. In contrast, direct income transfers increase the income of primary producers and decrease the net income of society as a whole. Thus, Alston and Pardey (1996) conclude that, economically, government investment in agricultural research and development may be a more efficient way of redistributing income from taxpayers to primary producers than direct income transfers.

3.2.2 When the objective addresses market failure

3.2.2.1 Missing markets

The first form of market failure that may justify government intervention is when circumstances are present that prevent a market from being established in a product or service (Young 1982; Beare and Newby 2005; Godden 2006). In order to understand what is preventing a market from being established in a product or service, it is important to understand the properties of the products or services involved. Randall (1983) argues that the critical properties to understand in this regard are exclusivity and rivalry.

Exclusivity exists when all the costs and benefits that arise from an individual's production or consumption of a product or service are embodied in market transactions (Scitovsky 1954; Maughan 2001). This means that it is possible to exclude others from receiving the benefits of an individual's production or consumption of a product or service, or to compel those others to pay for the benefits they receive. Likewise, when exclusivity exists it is possible to prevent production or consumption by one individual from imposing costs on others, or to compel that individual to compensate others for the costs imposed (Scitovsky 1954; Maughan 2001; Dwyer, Douglas, Peterson, Chong and Maddern 2006).

Conversely, when non-exclusivity exists, some benefits and/or costs that arise from an individual's production or consumption of a product or service are not embodied in market transactions. This means that it is not possible to exclude others from receiving

the benefits of an individual's production or consumption of a product or service, or to compel others to pay for the benefits they receive. Likewise, when non-exclusivity exists it is not possible to prevent production or consumption by one individual from imposing costs on others, or to compel that individual to compensate others for the costs imposed.

When some or all of the costs or benefits of production or consumption are non-exclusive then market transactions will result in a mix of products and services in the economy that is inefficient. Theoretically, this means that the welfare of society as a whole will be lower than optimal. If exclusivity can be established then it becomes possible to ensure that all the costs and benefits of producing and consuming a product or service are embodied in market transactions (Scitovsky 1954; Maughan 2001; Heaney, Dwyer, Beare, Peterson and Pechey 2005). This should result in a mix of products and services in the economy that is efficient. Theoretically, this means that the welfare of society as a whole will be optimal.

Rivalry exists when the production or consumption of a product or service by one individual affects the utility that others can experience from that product or service (Henderson and Quant 1980; Heaney, Dwyer, Beare, Peterson and Pechey 2005).

Conversely, non-rivalry exists when the production or consumption of a product or service by one individual does not affect the utility that others can experience from that product or service (Samuelson 1954).⁶ For some products or services, production or consumption by one individual does not affect the utility of others until a point of congestion is reached. Once this point is reached, any further production or consumption by one individual will affect the utility of others, thereby creating rivalry (Randall 1983; Dwyer, Douglas, Peterson, Chong and Maddern 2006).

As indicated in Figure 2, markets will not be established in a product or service when that product or service is non-exclusive in production *and* non-rival in consumption. If a product or service has this combination of properties then the private costs of producing the product or service will outweigh the private benefits from trade for the following

⁶ When non-rivalry exists it is not possible for any individual to appropriate a product or service for their own personal use (Henderson and Quant 1980).

reasons.⁷ If a product or service is non-exclusive in production then it is possible for individuals to consume the product or service without experiencing the costs of their consumption. This prevents any individual producer from experiencing the full benefits of producing the product or service and, at some point, the transaction costs of establishing a market will outweigh the benefits from trade. If a product or service is produced under these circumstances, less of it will be produced than is socially optimal. Further, if a product or service is non-rival in consumption then the marginal cost of consumption will be zero or close to zero (Belli 1997). For a product or service to be produced at a socially optimal level, the price of the product or service should be set to the marginal cost of production (Henderson and Quant 1980; Belli 1997). When the marginal cost of consumption is zero or close to zero, the transaction costs of establishing a market will outweigh the benefits from trade. If the product or service is produced under these circumstances, less of it will be produced than is socially optimal.

An often cited example of a product or service that is non-exclusive in production and non-rival in consumption is national defence. National defence is non-exclusive in production because it is possible for all individuals in a given nation to experience its benefits even if they do not contribute to its costs (Belli 1997; Simonis 2001). National defence is non-rival in consumption because the marginal cost of its consumption is zero or close to zero. To illustrate, Belli (1997:p.6) observes that ‘the cost of protecting a given territory against foreign invaders is the same, whether the inhabitants amount to one or two million.’ Other examples of products or services that are non-exclusive in production include biodiversity, some forms of information and aesthetic amenity.

From an economic perspective, government intervention can increase social welfare if it increases the production of products or services that are non-exclusive in production and non-rival in consumption to a level that is more socially desirable. As already noted, it is also necessary to ensure that the social benefits of a government intervention are likely to outweigh its costs. Examples of government interventions aimed at increasing the production of products and services that are non-exclusive in production and non-rival

⁷ Such products and services are commonly described as ‘public goods’ (Henderson and Quant 1980; Randall 1983; Simonis 2001).

in consumption include public provision and legislation to establish exclusivity in production. Public provision of national defence and information are examples of the former, while water entitlements and fishing quotas are examples of the latter.

3.2.3.2 Incomplete markets

The second form of market failure that may justify government intervention is when a market exists in a product or service, however, the production or consumption of the product or service creates costs or benefits that are not fully reflected in its price (Pigou 1920; Coase 1960; Randall 1972; Jones 1994; Vatn and Bromley 1997). In other words, there is a degree of non-exclusivity associated with the production or consumption of such products or services, as indicated in Figure 2. The non-exclusive benefits created by the production or consumption of such products or services are commonly called positive externalities, while the non-exclusive costs created by the production or consumption of such products or services are commonly called negative externalities.

Non-exclusive costs in production or consumption

When non-exclusive costs (or negative externalities) in production or consumption are present, an individual who benefits from producing or consuming a product or service does not experience the full costs of their production or consumption. In the case of non-exclusive costs in production, this will create an incentive for producers to use more of an input than is socially optimal. It may also create an incentive for producers to produce more of the products or services than is socially optimal. As a result, when non-exclusive costs in production are present, there will be a net private benefit in producers using more of an input than is socially optimal.

Some examples of inputs into primary production include irrigation water, pesticides and fertilisers. Another, less obvious example might be ecosystem services. When these inputs are used to produce agricultural products and services they may contribute to the spread of pests and diseases, eutrophication, water logging, downstream salinity, reductions in biodiversity and changes in the aesthetics of a landscape. Some non-exclusive costs in production that could result include reduced productivity for other primary producers, increased cost of water supply for domestic water users, reduced

amenity for those who value biodiversity and particular aesthetic features of the landscape, and reduced profitability of tourism enterprises (Dore and Burton 2001; Heaney, Dwyer, Beare, Peterson and Pechey 2005; Agrawala, Crick, Jette-Nantel and Tepes 2008).

A similar logic applies to non-exclusive costs in consumption, in that non-exclusive costs in consumption will create an incentive for consumers to consume more of a product or service than is socially optimal. As a result, when non-exclusive costs in consumption are present, there will be a net private benefit in consuming more of a product or service than is socially optimal. Examples of such products or services might include the consumption of plastic packaging and alcohol. Non-exclusive costs created by the consumption of such products and services might include reductions in the recreational and aesthetic amenity experienced by residents close to rubbish tips and rivers, losses arising from the effects of alcohol on the productivity of employees, and social and economic losses associated with alcohol-induced traffic accidents.

From an economic perspective, when non-exclusive costs in production or consumption are present, government intervention can increase social welfare if it reduces the production or consumption of pertinent products or services to a level that is more socially desirable. Further, it is a tenet of economics that, generally, an intervention in one market for a product or service should not create inefficiencies in other markets. Otherwise, a net reduction in social welfare may result.

There are two fundamental forms of government intervention for addressing non-exclusive costs in production or consumption in economics. The Coasian form of intervention involves establishing exclusivity in the non-exclusive cost. Legislation to specify and enforce property rights to saline and nutrient discharges is an example of this form of intervention (Kaine and Higson 2004; Duke 2005). The Pigouvian form of intervention involves establishing taxes and subsidies that reflect the value of the non-exclusive costs created in producing or consuming a product or service. Taxes on the use of water by primary producers and urban residents are examples of this form of intervention (Dwyer, Douglas, Peterson, Chong and Maddern 2006).

When the value of a non-exclusive cost depends on the timing of production or consumption decisions, the impact of a non-exclusive cost on social welfare will also depend on the timing of such decisions. For example, in irrigated agriculture, decisions about when to store water in reuse dams may critically affect the release of water and water soluble nutrients from a property into surface and groundwater systems (Kaine and Johnson 2004; Kaine and Higson 2006). On the one hand, social benefits are created from managing reuse dams to ensure that they are empty at the beginning of irrigation, because this maximises the potential for water runoff to be retained on property. On the other hand, private benefits are created from producers ordering water in advance of irrigation and storing it in reuse dams, because this enables them to exert greater control over irrigation scheduling.

It follows that, when the value of a non-exclusive cost depends on the timing of production or consumption decisions, the potential of a chosen intervention to enhance social welfare will depend on how well it influences the timing of pertinent production or consumption decisions. Both Coasian and Pigouvian forms of intervention can influence the timing of production and consumption decisions. With regard to the reuse dam example, a Coasian form of intervention might be to establish exclusive rights to nutrient releases or accessions to water systems. A Pigouvian form of intervention might be to levy differential taxes on nutrient releases from properties depending the time of release. Other forms of intervention might include public investment to identify technologies that improve the capacity of producers to exert control over irrigation scheduling, or the extension of information to increase the rate at which such technologies are taken up by producers.

Non-exclusive benefits in production or consumption

When non-exclusive benefits (or positive externalities) in production or consumption are present, an individual who bears the costs of producing or consuming a product or service does not experience the full benefits of their production or consumption. In the case of non-exclusive benefits in production, this will create an incentive for producers to use less of an input than is socially optimal. It may also create an incentive for producers to produce less of the products or services that the inputs are used to produce than is

socially optimal. As a result, when non-exclusive benefits in production are present, producers would tend to use less of an input than is socially optimal and, increasing their use of an input to a socially optimal level would create a net private cost.

Some examples of inputs into primary production include labour, irrigation water and honey bees. Some less obvious examples might also include biosecurity services (Economics and Policy Research Branch 2005), and technology and information resulting from research and development and extension (Alston and Pardey 1996; Marsh and Pannell 2000). When these inputs are used to produce agricultural products and services they may contribute to agglomeration forces in labour markets and technological innovation (Scitovsky 1954; Fujita and Thisse 1996; and Martin 1999)⁸, the volume of water in rivers, pollination of native plants, reductions in the spread of pests and diseases. Some non-exclusive benefits in production that might result include reduced cost of labour and technological innovation to primary producers and other businesses, increased amenity for recreational water users, reduced propagation costs for producers with crops and native forests, reduced pest control costs for primary producers and other businesses.

Again, a similar logic applies to non-exclusive benefits in consumption, in that non-exclusive benefits in consumption will create an incentive for consumers to consume less of a product or service than is socially optimal. Where this is the case increasing consumption to a socially optimal level would create a net private cost. The consumption of a balanced diet, for example, could contribute positively to the health of individuals and reduce the investment that a society needs to make in treating dietary related illnesses (National Health and Medical Research Council 2003). The health benefits of consuming a balanced diet might also increase the productivity of individuals, thereby increasing their contribution to the economy.

From an economic perspective, when non-exclusive benefits in production or consumption are present, government intervention can increase social welfare if it increases the production or consumption of pertinent products or services to a level that is more socially desirable. As mentioned for the conditions already described, for

⁸ also known as cumulative causation (Industry Commission 1997; Richardson 1997)

government intervention to be justified it is also necessary to ensure that the social benefits of government intervention outweigh the costs and that an intervention in one market for a product or service does not create inefficiencies in other markets.

Coasian and Pigouvian forms of intervention are fundamental to addressing non-exclusive benefits in production or consumption. Competitive tender systems whereby landholders bid to provide conservation services to government is an example of a Coasian form of intervention (Stoneham, Chaudhri, Ha and Strappazzon 2002; Chaudhri 2003). An example of a Pigouvian form of intervention would be a local council offering a rate rebate to residents for maintaining the nature strips adjacent to their properties.

When the value of a non-exclusive benefit depends on the timing of production or consumption decisions, the potential of a chosen intervention to enhance social welfare will depend on how well it influences the timing of pertinent production or consumption decisions. For example, if there are public benefits to be created by reducing water consumption in a certain time frame then forms of government intervention might include:

- the provision of information on the private benefits of water-saving technology;
- the provision of subsidies for the adoption of water-saving technology within a specified time period; and
- regulations that require new houses to have water-saving showerheads installed.

3.2.4.3 Imperfect markets

The third form of market failure that may justify government intervention is when a market exists in a product or service but competition in the market operates imperfectly due to one or more participants in the market being able to influence the price they receive or pay for products and services. This influence might arise from the cost structure of an industry (Henderson and Quant 1980) or information asymmetries (Stigler 1961; Arrow 1963b; Akerlof 1970). When competition in the market for a product or service operates imperfectly, the quantity and price of a product or service will not be socially optimal. The quantity and price of the product or service may be either less, or

more, than is socially optimal, depending on the source of the market imperfection and the interrelationships among participants in the market.

Cost structure and economies of scale

When the cost structure of an industry creates economies of scale, individual participants can become so large, relative to the market for a product or service, that they have sufficient market power to influence the price they pay or receive for a product or service by changing the quantity of the product or service they buy or supply. Typical examples of imperfect competition arising from the cost structure of an industry are monopolies, monopsonies, and oligopolies and oligopsonies (Henderson and Quandt 1980).

While monopolies and oligopolies are examples of imperfect competition in the supply of products or services, monopsonies and oligopsonies are examples of imperfect competition in the demand for products or services.⁹ In the following discussion, the potential impacts of economies of scale in the cost structure of an industry will be illustrated with reference to monopolies and oligopolies, which concern imperfect competition in the supply of products and services. A mirror image of this logic would apply to monopsonies and oligopsonies, which concern imperfect competition in the demand for products and services.

Cost structures that tend to promote market imperfections, such as monopolies and oligopolies, have been identified in the petroleum industry (Sampson 1975), the banking industry (Al-Muharrami, Matthews and Khabari 2006) and the pharmaceutical industry (Anis and Wen 1998). In relation to agricultural products and services, cost structures that promote monopolies and oligopsonies have been identified in industries that process and retail agricultural products and services (AGRA CEAS Consulting 2003; Upton 2005; Godden 2006).

When the cost structure of an industry promotes the formation of a monopoly the quantity of the product or service produced will tend to be less, and its price will tend to

⁹ While a perfectly competitive market has a large number of sellers, a monopolistic market has a single seller, and an oligopolistic market has a small number of sellers whose actions are interdependent. Similarly, while a perfectly competitive market has a large number of buyers, a monopsonistic market has a single buyer, and an oligopsonistic market has few buyers whose actions are interdependent.

be higher, than is socially optimal (Henderson and Quant 1980; AGRA CEAS Consulting 2003). When the cost structure of an industry promotes oligopolies, the quantity and price of the product or service produced may be either less, or more, than is socially optimal, depending on the nature of the product or service and the impacts of the sellers' price and quantity decisions on each other (Henderson and Quant 1980).

When the cost structure of an industry promotes imperfect competition, changing the quantity produced or the price of a product or service to socially optimal levels would create a net private cost for those that benefit from monopolistic or oligopolistic market power. From an economic perspective, government intervention can increase social welfare if it changes the quantity produced and the price of these products or services to levels that are socially optimal. As mentioned for previous conditions, for government intervention to be justified on economic grounds it is also necessary to ensure that an intervention in one market for a product or service does not create inefficiencies in other markets.

Forms of government interventions to change the quantity and price of products or services to levels that are socially optimal include:

- regulations to limit the size of businesses (Lock 1991);
- quota and buffer stock schemes to restrict the quantity of a product or service available in a market (Godden 2006);
- regulations to restrict the price of a product or service (Mougeot and Naegelen 2005);
- price equalisation schemes where there are alternative markets for a particular product or service (Godden 2006); and
- public provision of the product or service (Belli 1997; AGRA CEAS Consulting 2003).

Information asymmetry

Information asymmetry describes the situation where one participant in a market for a product or service has more, or better, information about the product or service than

another participant.¹⁰ This allows the better informed participant to influence the price of the product or service, or the conditions attached to the purchase of the product or service, at the expense of one or more other participants. In short, information asymmetries allow the better-informed participant to avoid bearing the full economic costs of their activities; these costs are transferred to other parties.

In some markets the seller of the product or service may be more informed than the buyer, while in other markets the buyer of the product or service may be more informed than the seller. For example, in the market for used-cars the seller is usually more informed than the buyer (Akerlof 1970). In contrast, in the market for health insurance the buyer is usually more informed than the seller (Arrow 1963b). With regard to agricultural products and services, Godden (2006) describes how, in Australia, buyers of food products and services potentially have less information about the safety of food than sellers as complex and expensive instruments are required to detect chemical and microbial contamination.

Information asymmetry leads to adverse selection (Akerlof 1970) and moral hazard (Ozanne, Hogan and Colman 2001; Ferraro 2008). These problems are typical in markets for insurance (Arrow 1963b; Belli 1997). Adverse selection occurs in insurance markets because, at the time of negotiating an insurance contract with an individual, an insurer may not have information to reliably predict how reckless the individual is likely to be. In the absence of such information, the insurer will be unable to set the insurance premium to a level that accurately reflects the risks associated with insuring the individual.

Under such circumstances, the benefits of insurance are likely to be greater for individuals who behave recklessly than for individuals who behave more cautiously. This creates a greater incentive for individuals who behave recklessly to buy insurance than for individuals who behave more cautiously. As a consequence, individuals who buy insurance are likely to be more reckless, on average, than the population as a whole.

¹⁰ In a perfectly competitive market for a product or service, information about the product or service is perfect and equally shared among all participants in the market (Sternberg 1996; Belli 1997).

Moral hazard also occurs in insurance markets because buying insurance may reduce the incentive for individuals to protect their insured belongings. This means that some individuals may take less care in protecting their belongings after they have insured them. If the insurer does not have information on which individuals take less care once they have insured their belongings and by how much, the insurer will be unable to adjust the insurance premium to accurately reflect changes in the risks that individuals take with their belongings.

Adverse selection and moral hazard in insurance markets result in more insurance claims being made than would otherwise be the case. All else being equal, this increases costs and decreases profits to insurers. In response, insurers can maintain profits by increasing premiums for all customers. This response, however, means that more cautious customers would pay higher premiums than would be the case in a perfectly competitive market, while more reckless customers would pay lower premiums. In other words, such a response would enable more reckless customers to avoid bearing the full costs of their recklessness, which would be transferred to more cautious customers.

Adverse selection and moral hazard may also occur in relation to agricultural products and services. Adverse selection, for example, may occur in some statutory marketing schemes for agricultural products if, at the time of negotiating a marketing contract with a primary producer, the statutory authority does not have information to reliably distinguish producers of higher quality products from producers of lower quality products (Godden 2006). In the absence of such information, the statutory authority will be unable to set the price that it pays for an individual producer's product at a level that accurately reflects the market value of the product.

As higher quality products would tend to attract a higher price in a competitive market than lower quality products, the returns to joining the statutory marketing scheme would tend to be lower for producers of higher quality products than would the returns from them either marketing their products themselves or from buying marketing services from private firms at low cost. The converse would be the case for producers of lower quality products. Under such circumstances, the incentive to join the scheme would be greater for producers of lower quality products than it would be for producers

of higher quality products. As a consequence, producers of lower quality products would be more likely to join the scheme than would producers of higher quality products.

Moral hazard may occur in relation to agricultural products when, for example, governments provide fodder subsidies in times of drought. Godden (2006) observes that such subsidies can create an incentive for some primary producers to maintain a higher stocking rate in times of drought than they would otherwise. In the absence of information that would enable governments to identify which producers will maintain a higher stocking rate under drought conditions as a result of fodder subsidies, governments will be unable to adjust the amount and availability of the subsidy accordingly.

When information asymmetries are present in a market for a product or service, the quantity of a product or service produced or consumed will be smaller, or larger, than is socially optimal and the price for the product or service will be correspondingly higher, or lower, than is socially optimal. In the insurance market, for example, information asymmetry tends to result in less insurance being produced at higher prices than is socially optimal. Changing the quantity produced or the price of a product or service to socially optimal levels would create a net private cost for participants in the market that benefit from such asymmetries.

From an economic perspective, government intervention can increase social welfare if it changes the quantity produced and the price of pertinent products or services to levels that are more socially desirable. As mentioned for previous conditions, for government intervention to be justified it is also necessary to ensure that interventions in existing markets for products and services should not create inefficiencies in other markets.

Forms of government intervention to change the quantity and price of products or services to levels that are socially optimal include:

- regulations forcing the disclosure of information (Etebari, Tourani-Rad and Gilbert 2004; Kirby 2004; Economics and Policy Research Branch 2005);

- regulations to restrict the behaviour of more informed individuals (Huddart, Ke and Shi 2007);
- taxes and subsidies on undesirable or desirable activities where evidence is required to either avoid the tax or receive the subsidy (Belli 1997). (An example of an undesirable activity would be smoking while an example of a desirable activity would be installing alarm systems);
- government provision of information (Belli 1997; Godden 2006); and
- food safety and animal welfare codes of practice and performance standards (Rama and Harvey 2009).

In this section we have described the first component framework of the Policy Choice Framework, the economic justification framework. The purpose of this component is to clarify some possible economic conditions that may justify government intervention. This is because some policy instruments will be more efficient than others in delivering on an objective, depending on the presence of such conditions.

We then outlined four fundamental economic conditions that may justify government intervention. These conditions were described as inequalities in income distribution, missing markets, incomplete markets and imperfect markets. After explaining why these conditions may result in the production of products and services that are lower, or higher than socially optimal, we explained how government intervention to address them may enhance social welfare.

In the next section we show how the economic justification framework can be used to clarify some possible economic justifications for government intervention to assist primary industries to adapt to climate change.

4.0 Clarifying possible economic justifications for assisting primary industries to adapt to climate change

4.1 Introduction

Victorian primary industries are highly vulnerable to the impacts of climate change, which are likely to include warmer temperatures and less rainfall, on average, increasing frequency of extreme events, and increasing competition for agricultural inputs such as water, fertiliser and fuel. Climate change may also affect the timing and length of growing seasons for particular crops and the suitability of regions for particular production activities (Intergovernmental Panel on Climate Change 2007). Moreover, according to the Intergovernmental Panel on Climate Change (2007) climate change is projected to lead to a decline in production from agriculture and forestry over much of southern and eastern Australia by 2030. In broad terms, individual primary producers may adapt to the impacts of climate change by pursuing one or more of the following generic strategies:

1. modifying production systems to change levels and mix of outputs;
2. modifying the levels and mix of production inputs (including, for example, land, labour, technology¹¹; environmental services; risk management tools such as insurance, fertilisers and pest and disease control); and
3. exiting primary production (Intergovernmental Panel on Climate Change 2001; Howden, Soussana, Tubiello, Chhetri and Dunlop 2007; Agrawala, Crick, Jette-Nantel and Tepes 2008; Fankhauser, Agrawala, Hanrahan, Pope, Skees, Stephens and Yasmine 2008).

In the absence of government intervention,¹² these adaptation strategies could potentially have a range of consequences for individual primary producers, primary industries and

¹¹ Technology is defined as the practical application of knowledge to achieve particular tasks that employs both technical artefacts (hardware, equipment) and (social) information ('software', know-how for production and use of artefacts) (Intergovernmental Panel on Climate Change 2007b: p 56).

¹² To assist adaptation

the broader community. In this section, we will step through the economic justification tree presented in Figure 2 to:

- (1) explore some of these consequences; and
- (2) explore their implications for the presence of conditions that may justify government intervention to assist primary industries to adapt to climate change.

4.2 Is the objective to modify income distribution?

The first question in Figure 2 asks if the policy objective is to modify income distribution. If individual primary producers are unable to adapt to the impacts of climate change without experiencing declining returns then one consequence could be that the incomes of primary producers may fall below a threshold that is acceptable to the broader community.¹³ If this were the case then it could be argued that inequalities in income may justify government intervention to assist primary industries to adapt to climate change, as indicated by the left-hand branch of the tree in Figure 2.

Further, if the net benefits of government intervention are anticipated to outweigh its costs then the principle that interventions should directly address the economic condition of concern might be used to inform instrument choice. Generally speaking, this would favour direct welfare payments. However, because welfare payments may reduce the rate of economic growth, government intervention to reduce the cost of agricultural innovation may be preferable in some circumstances. Such intervention may take the form of government investment in research and development. As noted earlier, in some circumstances, this form of intervention could improve the incomes of primary producers and increase economic growth at the same time.

4.3 Are the products or services concerned non-exclusive in production and non-rival in consumption?

After considering whether the objective is to modify income distribution, the next branch of the tree in Figure 2 asks if the products or services concerned are non-exclusive in

¹³ Technically, this is a case where the utility functions of consumers are interdependent since the utility of individuals who are not primary producers is affected by their knowledge that the incomes of others are lower than they deem desirable, in this case the incomes of primary producers.

production and non-rival in consumption. Because the outputs of primary production are agricultural commodities, such as fibre and food, that are rival in consumption this suggests that the next question to consider is whether there are non-exclusive costs and benefits created in the production or consumption of these products.

4.4 Are non-exclusive costs or benefits created in production or consumption?

Non-exclusive costs (or negative externalities) and benefits (or positive externalities) are created in both the production and consumption of agricultural commodities. On the production side, potential non-exclusive costs and benefits relate to the use of production inputs such as labour, honey bees, irrigation water, agricultural chemicals, ecosystem services, risk management tools, and the use of technology resulting from research and development and extension.

Recall that potential non-exclusive costs in production might include reduced productivity for other primary producers, increased cost of water supply for domestic water users, reduced amenity for those who value biodiversity and particular aesthetic features of the landscape, and reduced profitability of tourism enterprises. Likewise, examples of potential non-exclusive benefits in production might include reduced cost of labour and technological innovation to primary producers and other businesses, increased amenity for recreational water users, reduced propagation costs for producers with crops and native forests, and reduced pest control costs for primary producers and other businesses.

As observed earlier, examples of potential non-exclusive costs associated with the consumption of agricultural commodities might include any negative health effects from individuals consuming an unbalanced diet. Conversely, examples of potential non-exclusive benefits associated with the consumption of agricultural commodities might include any positive health effects from individuals consuming a balanced diet.

The critical issue in answering the question 'Are non-exclusive costs or benefits created in production or consumption?' in relation to the policy objective of assisting primary

industries to adapt to climate change is whether¹⁴ the incidence and magnitude of the non-exclusive costs and benefits of primary production are likely to be significantly affected by the strategies that primary producers put into practice to adapt to climate change. If the incidence and magnitude of such non-exclusive costs and benefits are likely to be significantly affected then the next issue to consider is the source of the non-exclusive costs and benefits affected.

To illustrate, it is anticipated that climate change is likely to lead to changes in the intensity of rainfall and the frequency of floods (Intergovernmental Panel on Climate Change 2007). In some regions, this could mean an increase in rates of erosion and the leaching of nutrients from the soil (Segerson 1988; Alexandra and Eyre 1993; Stokes and Howden 2008). Two potential consequences of these changes for primary production are that (1) affected primary producers may need to use more fertiliser to achieve a given yield; and (2) the nutrient discharge into surface water for a given level of fertiliser use may increase.

While a range of technical options have been developed to manage nutrients in agriculture¹⁵, these options may need to be modified or integrated in different ways to address these potential consequences (Howden, Gifford and Meinke 2008). If primary producers are unable to identify and apply appropriate options to reduce the flow-on effects of using fertiliser to produce agricultural commodities in affected regions, the non-exclusive costs of fertiliser use may increase significantly as a result of climate change.

The source of these non-exclusive costs lies in the properties of an input into primary production, which might be described as the capacity of the environment to assimilate nutrients, an ecosystem service. At this point, consideration should be given to identifying the condition(s) leading to market failure in this input. Logically, this would involve revisiting the question posed in the second branch of the tree in Figure 2 and stepping through the tree again until the fundamental conditions(s) leading to market failure in the appropriate market(s) are identified.

¹⁴ In the absence of government intervention to assist adaptation.

¹⁵ Including crop management practices, crop varieties, rotation practices and water management practices (Howden, Gifford and Meinke 2008)

Hence, in relation to this example, we would ask whether the capacity of the environment to assimilate nutrients is non-exclusive in production and non-rival in consumption. Because this ecosystem service is non-exclusive in production and rival in consumption, this suggests that the condition of concern is not a missing market in the capacity of the environment to assimilate nutrients. Therefore, the next question to consider is whether there are non-exclusive costs and benefits created in the production or consumption of this ecosystem service.

When the capacity of the environment to assimilate nutrients is used to produce agricultural commodities non-exclusive costs are created. Some examples include reduced productivity for other primary producers, increased cost of water supply for domestic water users, and reduced scenic amenity for recreational water users. This suggests that there is an incentive for more of this ecosystem service to be used to produce agricultural commodities than is socially optimal. Further, reducing its use to a socially optimal level would involve a net private cost. It follows that incomplete markets in the capacity of the environment to assimilate nutrients may justify government intervention to assist primary producers to adapt to climate change.

Logically, this sort of analysis would be conducted for all of the non-exclusive costs and benefits of primary production that are likely to be significantly affected by the strategies primary producers put into practice to adapt to climate change. While we have explored potential non-exclusive costs associated with the capacity of the environment to assimilate nutrients resulting from primary production, we will now use an illustrative example to explore some non-exclusive benefits of primary production that may be significantly affected by climate change.

It is anticipated that climate change is likely to lead to a contraction of primary production over much of southern and eastern Australia by 2030 (Intergovernmental Panel on Climate Change 2007). Such a result may significantly reduce the magnitude and incidence of the non-exclusive benefits that Victorian businesses experience from primary production, such as those arising from the contribution that primary production might make to agglomeration forces in labour markets and technological innovation (Scitovsky 1954; Fujita and Thisse 1996; and Martin 1999).

Because the source of these non-exclusive costs lies in the properties of inputs into primary production, labour and technology, consideration should now be given to identifying the condition(s) leading to market failure in these inputs. As for the previous example, this would involve revisiting the question posed in the second branch of the tree in Figure 2 and stepping through the tree again until the fundamental conditions(s) leading to market failure in the appropriate market(s) are identified.

With regard to labour, we would therefore ask whether it is non-exclusive in production and non-rival in consumption. If labour contributes to agglomeration forces in the labour market, which, in turn, reduces labour costs for other businesses then labour in this context is non-exclusive in production. Further, the use of a unit of labour by one producer renders that unit unavailable for use by another producer; therefore, labour is rival in consumption. This combination of properties suggests that, in theory, less labour will be used in primary production than is socially optimal. Further, increasing its use to a socially optimal level would involve a net private cost. It follows that incomplete markets in labour may justify government intervention to assist primary producers to adapt to climate change.

Returning to technology, we would start by asking whether it is non-exclusive in production and non-rival in consumption. Depending on the nature of the knowledge or information involved in a given technology, it can be non-exclusive in production and non-rival in consumption (Alston and Pardey 1996; Marsh and Pannell 2000; Ha 2006; and Rama and Harvey 2009). Thus, if technology has these properties, less of it will be used to produce agricultural commodities than is socially optimal. Further, increasing its use to a socially optimal level would involve a net private cost. This is widely recognised by governments, and is a traditional justification for government investment in agricultural research and development (Alston and Pardey 1996; and Mullen, Vernon and Fishpool 2000).¹⁶ It follows that missing markets in some types of technology may justify government intervention to assist primary producers to adapt to climate change.

¹⁶ While we have focussed on potential non-exclusive benefits associated with the contribution of technology to agglomeration forces in technological innovation, this represents only one pathway through which non-exclusive benefits can be created from the development and use of technology (for a more comprehensive coverage see for example Alston and Pardey 1996; and Ha 2006).

At the same time, technology that is rival in consumption can contribute to agglomeration forces in technological innovation. This means that the development and use of such technology in primary production may create non-exclusive benefits. Under these circumstances less of this technology will be used to produce agricultural commodities than is socially optimal. Further, increasing its use to a socially optimal level would involve a net private cost. It follows that incomplete markets in these sorts of technology may also justify government intervention to assist primary producers to adapt to climate change.

4.5 Can participants in the market influence the price they pay or receive?

While we have explored some potential justifications for government intervention associated with missing and incomplete markets, it can be seen from Figure 2 that one more question remains to be asked. In relation to the policy objective of assisting primary industries to adapt to climate change, this question concerns whether, in the absence of government intervention, adaptation to climate change would enable participants in markets for agricultural products or services to influence the prices they pay, or receive, for such products and services. For example, where the cost structure of an industry creates economies of scale or where there are significant information asymmetries.

Our review of the literature on the expected impacts of climate change did not reveal any evidence to suggest that these sources of market imperfection are likely to be significant with regard to agricultural adaptation to climate change. The cost structures of primary industries do not generally favour economies of scale (Godden 2006; and Rama and Harvey 2009) and there appears to be little evidence to suggest that adaptation to climate change is likely to alter this.

With regard to information, the evidence seems to draw attention to a general inadequacy of information rather than potential asymmetries. For example, inadequate information on:

- the impact of climate change climate on the short-term weather patterns;

- potential socio-economic impacts of climate change (particularly at smaller scales);
- social inequalities in access to information; and
- the cost and effectiveness of adaptation measures (Fankhauser, Smith and Tolc 1999; Intergovernmental Panel on Climate Change 2007).

5.0 Limitations

As noted earlier, developing the Policy Choice Framework has been an exercise in continuous improvement. Therefore, the Framework has evolved in light of experience and will continue to evolve as gaps in the issues it addresses are identified. We have used the first component of the Framework in this report to illustrate the range of possible justifications for government intervention to assist primary industries to adapt to climate change. As such, the findings in this report are intended to be illustrative rather than comprehensive or definitive.

6.0 Summary and Conclusions

In this report, we have used the first component of the Policy Choice Framework to explore economic conditions that may justify government intervention to assist primary industries to adapt to climate change.

We began the report by drawing attention to the potential vulnerability of Victorian primary industries to the impacts of climate change and the imperative for them to adapt. The aim in this research was to support the Victorian Government's efforts to identify appropriate policy responses by clarifying the presence of conditions that may justify government intervention to assist primary industries to adapt to climate change. This provides a foundation for identifying policy instruments that will deliver on this objective as efficiently as possible, given available data on the potential impacts of climate change on Victorian primary industries and the adaptation responses of producers.

After briefly outlining the Policy Choice Framework, we described the first component of it in detail. In doing so, we described four fundamental economic conditions that may justify government intervention. These conditions were described as inequalities in income distribution, missing markets, incomplete markets and imperfect markets. After distinguishing income distribution from the other three conditions, we explained why these conditions may justify government intervention. Next, we described how government intervention to address them may enhance social welfare.

We then presented some examples to show how climate change and the efforts of primary producers to adapt to it could potentially lead to:

1. A decline in the incomes of primary producers below a threshold that is acceptable to the broader community. This may justify government intervention on the grounds of inequalities in income distribution.
2. Significant changes in the social costs and benefits created in the production or consumption of agricultural commodities. This may justify government intervention on the grounds of missing or incomplete markets. Examples provided included:
 - increases in social costs as a result of incomplete markets in the capacity of the environment to assimilate nutrients, an ecosystem service;
 - declines in social benefits as a result of incomplete markets in labour and technology; and
 - declines in social benefits as a result of missing markets in some types of technology (i.e. technology that is non-exclusive in production and non-rival in consumption).

Recall that the conditions described would be necessary, though not sufficient, to justify government intervention. For intervention to be justified it would also be necessary to establish that the social benefits of the chosen intervention are likely to outweigh its anticipated costs.

The findings illustrate how a number of conditions may potentially justify government intervention to assist primary industries to adapt to climate change. The findings also highlight the importance of distinguishing inequalities in income distribution from conditions that lead to market failure. With respect to the latter, the findings underscore the importance of identifying which condition(s) are present and precisely which markets they are present in, if efficient interventions are to be identified. These findings are intended to be illustrative rather than comprehensive or definitive.

7.0 Next Steps

In the next stage of the research we plan to build on the progress that has been made in forecasting the regional impacts of climate change and identifying the characteristics that agricultural practices will need to have to enable primary producers to adapt in specific regions. To this end, we plan to use the Policy Choice Framework to reveal the critical issues that will need to be addressed to assist primary industries to adapt in a specific region. This will provide a basis for identifying efficient policy instruments for assisting adaptation in that region. We anticipate that the insights gained from grounding this analysis in a particular region will provide practical insights into the nature of the challenges posed by climate change at a regional level and the policy instruments that may assist primary industries to manage them.

References

- AGRA CEAS Consulting 2003, *Economic Evaluation of the Pig Industry Restructuring Scheme*, AGRA CEAS Consulting in association with Department of Agricultural Sciences Imperial College of London.
- Agrawala, S., Crick, F., Jette-Nantel, S. and Tepes, A. 2008, 'Empirical estimates of adaptation costs and benefits: a critical assessment,' in *Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments*, eds S. Agrawala and S. Fankhausera, Paris, Organisation for Economic Co-operation and Development Paris, pp. 29-84.
- Akerlof, G. A. 1970, 'The market for 'lemons': quality uncertainty and the market mechanism,' *Quarterly Journal of Economics*, vol. 84, no. 3, pp. 488-500.
- Alexandra, J. and D. Eyre 1993, 'Water and Environment,' *Water in Australia: Managing Economic, Environmental and Community Reform*, in M. Johnson and S. Rix, Pluto Press Australia Limited. Leichhardt, NSW, pp. 85-120.
- Al-Muharrami, S., Matthews, K. and Khabari, Y. 2006, 'Market structure and competitive conditions in the Arab GCC banking system,' *Journal of Banking & Finance*, vol. 30, no. 12, pp. 3487-3501.
- Alston, J. and Pardey, P. G. 1996, *Making Science Pay: The Economics of Agricultural R&D Policy*, The American Enterprise Institute, Washington, D.C.
- Anis, A. H. and Wen, Q. 1998, 'Price regulation of pharmaceuticals in Canada,' *Journal of Health Economics*, vol. 17, no. 1, pp. 21-38.
- Arrow, K. J. 1963a, *Social Choice and Individual Values*, John Wiley and Sons, New York.
- Arrow, K. J. 1963b, 'Uncertainty and the welfare economics of medical care,' *The American Economic Review*, vol. 53, no. 5, pp. 941-973.
- Australian Government 2007, *Australia's Climate Change Policy: our Economy, our Environment, our Future*, The Department of Prime Minister and Cabinet, Canberra.
- Australian Government 2008, *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future*, White Paper, Department of Climate Change, Canberra.

- Beare, S. and Newby, J. 2005, 'Incomplete markets, excluded goods and natural resource management', paper presented to Australian Agricultural and Resource Economics Society, 9-11 February, Coffs Harbour, Australian Bureau of Agricultural and Resource Economics.
- Beer, A., Maude, A. and Pritchard, B. 2003, *Developing Australia's Regions: Theory and Practice*, University of NSW Press.
- Belli, P. 1997, 'The comparative advantage of government: a review,' *World Bank Policy Research Working Paper No. 1834*, World Bank.
- Campbell, K. O. and Fisher, B. S. 1991, *Agricultural Marketing and Prices*, Melbourne, Longman Cheshire.
- Chaudhri, V. 2003, *Land Stewardship: Market-like Policy Options*, Department of Sustainability and Environment, Melbourne.
- Coase, R. H. 1960, 'The problem of social cost,' *Journal of Law and Economics*, vol. 3, pp. 1-44.
- Dore, M. and Burton, I. 2001, *The Costs of Adaptation to Climate Change in Canada: A Stratified Estimate by Sectors and Regions- Social Infrastructure*, Climate Change Laboratory, Brock University, St Catharines, Ontario.
- Duke, C. 2005, *Cap and Trade for Salinity: Property Rights and Private Abatement Activities, a Laboratory Experiment Market*, National Market-based Instruments Pilot Program, University of Melbourne and the Victorian Department of Primary Industries, Melbourne.
- Dwyer, G., Douglas, R., Peterson, D., Chong, J. and Maddern, K. 2006, *Irrigation Externalities: Pricing and Charges*, Staff working paper, Productivity Commission, Melbourne.
- Economics and Policy Research Branch 2005, *Economic Issues in Biosecurity*, Victorian Department of Primary Industries, Melbourne.
- Etebari, A., Tourani-Rad, A. and Gilbert, A. 2004, 'Disclosure regulation and the profitability of insider trading: Evidence from New Zealand,' *Pacific-Basin Finance Journal*, vol. 12, no. 5, pp. 479-502.

- Fankhauser, S., Agrawala, S., Hanrahan, D., Pope, G., Skees, J., Stephens, C. and Yasmine, S. 2008, 'Economic and policy instruments to promote adaptation,' in *Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments*, eds S. Agrawala and S. Fankhausera, Paris, Organisation for Economic Co-operation and Development Paris, pp. 85-133.
- Fankhauser, S., Smith, J. B. and Tolc, R. S. J. 1999, 'Weathering climate change: some simple rules to guide adaptation decisions,' *Ecological Economics*, vol. 30, no. 1, pp. 67-78.
- Ferraro, P. J. 2008, 'Asymmetric information and contract design for payments for environmental services,' *Ecological Economics*, vol. 65, no. 4, pp. 810-821.
- Fujita, M. and Thisse, J.-F. 1996, 'Economics of agglomeration,' *Journal of the Japanese and International Economies*, vol. 10, pp. 339-378.
- Garnaut, R. 2008, *The Garnaut Climate Change Review: Final Report*, Cambridge University Press, Cambridge.
- Godden, D. 2006, *Agricultural and Resource Policy: Principles and Practice*, Sydney University Press, Sydney.
- Greenwald, B. and Stiglitz, A. A. 1986, 'Externalities in economics with imperfect information and incomplete markets,' *Quarterly Journal of Economics*, vol. 101, pp. 229-264.
- Ha, A. 2006, *Role of Government and Researcher' Incentives: Primary Industries Research, Development and Extension*, Department of Primary Industries, Victoria, Melbourne.
- Heaney, A., Dwyer, G., Beare, S., Peterson, D. and Pechey, L. 2005, 'Third-party effects of water trading and potential policy responses', paper presented, 25-27 July, Providence, Rhode Island, American Agricultural Economics Association.
- Henderson, J. E. and Quant, R. E. 1980, *Micro Economic Theory: A Mathematical Approach*, McGraw-Hill, New York.
- Hilmer, F., Raynor, M. and Taperell, G. 1993, *National Competition Policy*, Report of the Independent Committee of Inquiry, Australian Government Publishing Service, Canberra.

- Howden, S. M., R. G. Gifford and H. Meinke 2008, 'Grains,' in *An Overview of Climate Change Adaptations in Australian Primary Industries-Impacts, Options and Priorities*, eds C. J. Stokes and S. M. Howden, C.S.I.R.O., pp. 43-70.
- Howden, S. M., Soussana, J.-F., Tubiello, F. N., Chhetri, N. and Dunlop, M. 2007, 'Adapting Agriculture to Climate Change,' *Proceedings of the National Academy of Sciences of the United States of America*, vol. 104, no. 50, pp. 19691-19696.
- Huddart, S., Ke, B. and Shi, C. 2007, 'Jeopardy, non-public information, and insider trading around SEC 10-K and 10-Q filings,' *Journal of Accounting and Economics*, vol. 43, no. 1, pp. 3-36.
- Industry Commission 1997, *The Automotive Industry*, Volume 1, Report.
- Intergovernmental Panel on Climate Change 2001, *Climate Change 2001: Working Group II: Impacts, Adaptation and Vulnerability*, Cambridge University Press, Cambridge.
- Intergovernmental Panel on Climate Change 2007, *Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability*, Cambridge University Press, Cambridge.
- Intergovernmental Panel on Climate Change 2007b, *Climate Change 2007: Synthesis Report*, Cambridge University Press, Geneva, Switzerland.
- Jones, R. (ed.) 1994, *Australian Microeconomic Policies*, 4th, Prentice Hall, New York.
- Kaine, G. and Higson, M. 2004, *A tradable permit program for nitrogen emissions to Lake Taupo*, Social Research Working Paper 08/04, AgResearch, Hamilton, New Zealand.
- Kaine, G. and Higson, M. 2006, 'Understanding variety in landholders' responses to resource policy,' *Australian Agribusiness Review*, vol. 14, Paper 6.
- Kaine, G. and Johnson, F. 2004, 'Water policy in New Zealand and Australia: we're not playing for tiddlywinks', in *Proceedings of the New Zealand Grasslands Association* October, Ashburton.
- Kaine, G., Ford, J., Leth, M. and Johnson, F. 2007, *Policy Choice Framework*, Practice Change Research working paper 02/07, Department of Primary Industries, Victoria.
- Kirby, A. J. 2004, 'The product market opportunity loss of mandated disclosure,' *Information Economics and Policy*, vol. 16, no. 4, pp. 553-577.

- Lock, R. H. J. H. 1991, 'Anti-trust and regulatory issues in a competitive electric industry,' *Utilities Policy*, vol. 1, no. 3, pp. 220-233.
- Marsh, S. P. and Pannell, D. J. 2000, 'Agricultural extension policy in Australia: the good, the bad and the ugly,' *The Australian Journal of Agricultural and Resource Economics*, vol. 44, no. 4, pp. 605-627.
- Martin, P. 1999, 'Public policies, regional inequalities and growth,' *Journal of Public Economics*, vol. 73, pp. 85-105.
- Maughan, B. 2001, 'Property and Intellectual Property: Foundations in Law and Economics', in *Proceedings Symposium "A New Feudalism of Ideas?"* 26 June 2001, Bournemouth University, Centre for Intellectual Property Policy and Management.
- Mougeot, M. and Naegelen, F. 2005, 'Hospital price regulation and expenditure cap policy,' *Journal of Health Economics*, vol. 24, no. 1, pp. 55-72.
- Mullen, J. D., Vernon, D. and Fishpool, K. I. 2000, 'Agricultural extension policy in Australia: public funding and market failure,' *The Australian Journal of Agricultural and Resource Economics*, vol. 44, no. 4, pp. 629-645.
- National Health and Medical Research Council 2003, *Dietary Guidelines for Australian Adults*, Canberra.
- Natural Resource Management Ministerial Council 2006, *National Agriculture and Climate Change Action Plan 2006-2009*, Department of Agriculture, Fisheries and Forestry on behalf of the Natural Resource Management Ministerial Council, Barton, ACT.
- Ozanne, A., Hogan, T. and Colman, D. 2001, 'Moral hazard, risk aversion and compliance monitoring in agri-environmental policy,' *European Review of Agricultural Economics*, vol. 28 pp. 329-347.
- Pannell, D. J. 2001, 'Dryland salinity: economic, scientific, social and policy dimensions,' *Australian Journal of Agricultural and Resource Economics*, vol. 45, no. 4, pp. 536-537.
- Pannell, D. J. 2004, 'Heathens in the chapel? Application of economics to biodiversity,' *Pacific Conservation Biology*, vol. 10, no. 2/3, pp. 88-105.

- Pannell, D. J. 2006 (updated 24/06/2006), 'Public benefits, private benefits: the final framework,' Pannell Discussions no. 80, 19 June 2006. Retrieved 12/12/2006 from <http://cyllene.uwa.edu.au/~dpannell/pd/pd0080.htm>
- Pannell, D. J. 2006a (updated 28/05/2006), 'Public benefits, private benefits, and the choice of policy tool.' Retrieved 12/12/2006 from <http://cyllene.uwa.edu.au/~dpannell/pd/pd0073.htm>
- Pannell, D. J. 2006b (updated 26/07/2006), 'Public benefits, private benefits, and the choice of policy tool for land-use change.' Retrieved 12/12/2006 from <http://cyllene.uwa.edu.au/~dpannell/dp0601.htm>
- Pannell, D. J. 2006c (updated 27/05/2006), 'Public benefits, private benefits, and incentives for changing land management,' Pannell Discussions no. 74, 8 May 2006. Retrieved 12/12/2006 from <http://cyllene.uwa.edu.au/~dpannell/pd/pd0074.htm>
- Pannell, D. J. 2006d (updated 16/06/2006), 'Public benefits, private benefits, and technology development,' Pannell Discussions no. 79, 12 June 2006. Retrieved 12/12/2006 from <http://cyllene.uwa.edu.au/~dpannell/pd/pd0079.htm>
- Pannell, D. J. 2008, 'Public benefits, private benefits and policy mechanism choice for land-use change: technology change', paper presented to *52nd Annual Conference of the Australian Agricultural and Resource Economics Society*, 5-8 Feb 2008, Canberra.
- Pigou, A. C. 1920, *The Economics of Welfare*, McMillan, London.
- Powell, R. A., Thompson, D. and Chalmers, L. 2006, *Regional Impact Analysis: Nandewar: stage 2 / Centre for Agricultural and Regional Economics* Resource and Conservation Assessment Council, Sydney.
- Productivity Commission 2001, *Structural Adjustment-Key Policy Issues*, Commission Research Paper, AusInfo, Canberra.
- Productivity Commission 2009, *Government Drought Support*, Report No. 46, Final Inquiry Report, Melbourne.

- Rama, I. and Harvey, S. 2009, *Market Failure and the Role of Government in the Food Supply Chain*, Department of Primary Industries, Victoria, Melbourne.
- Randall, A. 1972, 'Market solutions to externality problems: theory and practice,' *American Journal of Agricultural Economics*, vol. 54, no. 2 pp. 175-183.
- Randall, A. 1983, 'The problem of market failure,' *Natural Resources Journal*, vol. 23, pp. 131-148.
- Rhoads, S. E. 1985, *The Economist's View of the World: Government, Markets and Public Policy*, Cambridge, Cambridge University Press.
- Richardson, D. 1997, 'Industry Policy: Mortimer, Goldsworthy and the Economist Intelligence Unit,' *Parliament of the Commonwealth of Australia, Current Issues Brief* vol. no. 4.
- Sampson, A. 1975, *The Seven Sisters: The Great Oil Companies and the World They Shaped*, Viking Press, New York.
- Samuelson, P. A. 1947, *Foundations of Economic Analysis*, Harvard University Press, Cambridge, Massachusetts.
- Samuelson, P. A. 1954, 'The pure theory of public expenditure,' *Review of Economics and Statistics*, vol. 36, no. 4, pp. 387-389.
- Sandall, J., Johnson, F., Kaine, G. and Higson, M. 2007, *A Review of Climate Change Policy United Nations, Australia, New Zealand, China and Brazil*, Department of Primary Industries, Victoria.
- Scitovsky, T. 1954, 'Two concepts of external economies,' *The Journal of Political Economy*, vol. 62, no. 2, pp. 143-151.
- Segerson, K. 1988. 'Uncertainty and incentives for nonpoint pollution control,' *Journal of Environmental Economics and Management*, vol, 15, no. 1, pp. 87-98.
- Sen, A. K. 1970, *Collective Choice and Social Welfare*, Oliver and Boyd, London.
- Simonis, J. B. D. 2001, 'Institutions and the imperfect market,' *International Journal of Social Economics*, vol. 28, no. 3, pp. 295-307.
- Stern, N. 2007, *The Economics of Climate Change: The Stern Review*, Cambridge University Press, Cambridge.

- Sternberg, E. 1996, 'Recuperating from market failure: planning for biodiversity and technological competitiveness,' *Public Administration Review*, vol. 56, no. 1, pp. 21-29.
- Stigler, G. J. 1961, 'The economics of information,' *The Journal of Political Economy*, vol. 69, no. 3, pp. 213-225.
- Stokes, C. J. and S. M. Howden, Eds. 2008, *An Overview of Climate Change Adaptations in Australian Primary Industries-Impacts, Options and Priorities*, C.S.I.R.O.
- Stoneham, G., Chaudhri, V., Ha, A. and Strappazzon, L. 2002, 'Victoria's bush tender trial: a cost sharing approach to biodiversity,' *Wool Technology and Sheep Breeding*, vol. 50, no. 4, pp. 754-759.
- The Department of Prime Minister and Cabinet 2002, *Australia's Climate Change Policy Our Economy, Our Environment, Our Future*, Commonwealth of Australia, Canberra.
- Upton, M. 2005, *Farmers' Adjustments in Response to Increased Regulatory Costs*, Department for Environment, Food and Rural Affairs, United Kingdom.
- Vatn, A. and Bromley, D. W. 1997, 'Externalities - a market model failure,' *Environmental and Resource Economics*, vol. 9, no. 2, pp. 135-151.
- Victorian Government Department of Premier and Cabinet 2008, *A Climate of Opportunity: Summit Paper*, Victorian Government Department of Sustainability and Environment, Melbourne.
- Victorian Government Department of Sustainability and Environment 2006, *Our Environment Our Future- Sustainability Action Statement 2006*, Victorian Government Department of Sustainability and Environment,, Melbourne.
- Worrell, M., Milham, N. and Curthoys, C. 1998, *Drought Relief and Rural Adjustment Policy in Australian*, Economic Services Unit, NSW Agriculture.
- Young, O. R. 1982, *Resource Regimes: Natural Resources and Social Institutions*, University of California Press, Berkeley.

Appendix: Landholder and organisational stages in the Policy Choice Framework (Components 3–7)

Landholder/ primary producer responses¹⁷

In the second stage of the PCF the likely responses of landholders to the policy instrument selected in the first stage are identified and the implications for the feasibility and design of the instrument are considered. There are three components in this stage - I₃ Response Framework, use variety framework and the scoping framework (Kaine and Higson 2006b; Kaine and Johnson 2004; Murdoch, Bewsell, Lourey and Kaine 2006).

The I₃ Response Framework predicts the responses of landholders to proposed changes in land management and the policy instruments supporting those changes. The responses of landholders are assumed to depend on their involvement and attitudes towards the policy issue at hand, and their involvement and attitudes towards the policy instrument itself. Involvement is a social psychology construct and describes the motivational state of an individual with regard to some issue or activity. The strength of involvement depends on the relevance of the issue or activity to the achievement of the individual's utilitarian, social or hedonic goals (Mittal and Lee 1989).

Involvement predicts the level of effort an individual will invest in decision-making about the issue or activity. Effort includes dimensions such as the extensiveness of decision-making, the number of factors evaluated in a decision, the number of alternative actions considered and the time spent to reach a decision (Dholakia 2001; Kapferer and Laurent 1986; Mittal and Lee 1989; Poiesz and de Bont 1995; Verbeke and Vackier 2004; Zaichkowsky 1986).

The concept of involvement is used in the I₃ Response Framework to predict the likely behavioural responses of landholders to a policy instrument depending on:

- Their degree of involvement in the policy issue
- Their attitudes towards the policy issue if involvement in the issue is high
- Their degree of involvement in the policy instrument
- Their attitudes towards the policy instrument if involvement in the instrument is high

In broad terms, landholders' involvement in the instrument will be high and their attitude will be positive (negative) if the land management change creates large private net benefits (costs).

The two dimensions of involvement, involvement with the issue and involvement with the intervention, are combined to predict different categories of behavioural response among landholders to a policy instrument (see Figure A.1). Importantly, the framework may assist in identifying behavioural responses that will lead to policy failure, such as non-compliance and outrage. Once the responses of landholders have been identified, alterations to policy instrument, or new policy instruments that reduce the risk of eliciting these types of response from landholders can be considered.

¹⁷ This section was adapted from Kaine, Johnson, Lourey, Ford, Keeble, and Higson (2008).

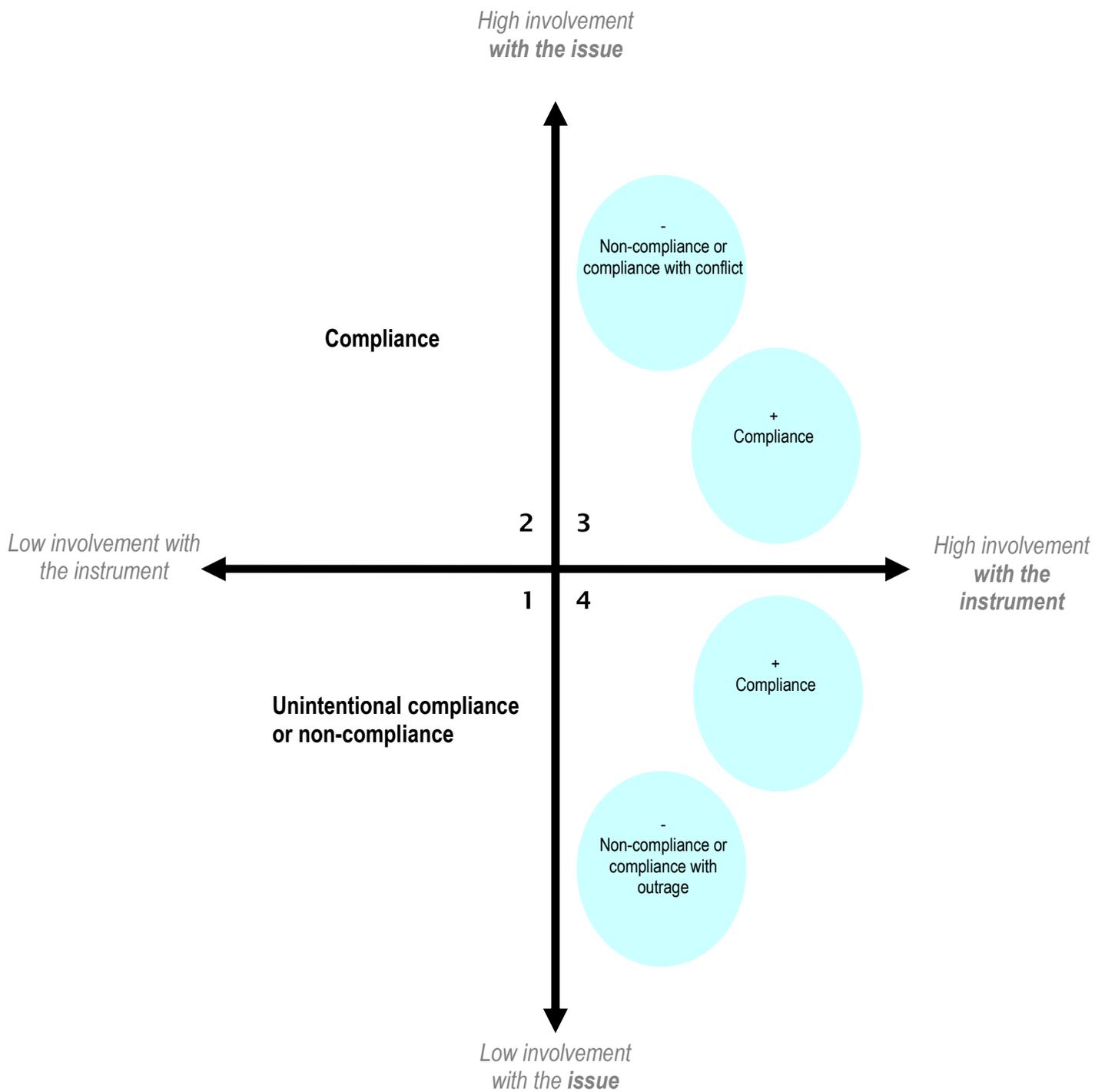


Figure A.1 ¹³ Response Framework

Source: Adapted from Murdoch, Bewsell, Lourey and Kaine (2006)

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The I₃ response framework is followed by the use variety framework (Kaine and Higson 2006b). In this framework the potential for landholders to comply with the policy instrument in ways that are counter-productive to the achievement of the policy objective is considered (Kaine and Higson 2006b). Where the potential for use variety is unacceptably high this potential may be reduced by introducing modifications to the instrument or employing supplementary instruments. Policy instruments are eliminated from consideration where landholders are most likely to use them in counter-productive ways and this cannot be managed.

So far, we have evaluated the response of landholders to proposed policy instruments and modified or eliminated those instruments that could fail as a result of landholder responses. We have also eliminated those instruments that could be implemented but be counter-productive to the policy objective. We have yet to evaluate the remaining options in terms of whether or not they elicit a behavioural response that will result in the achievement of the policy objective. There are two aspects to this – whether the responses of landholders would be of a scale sufficient to achieve the policy objective and whether the landholders will respond at a sufficient rate to achieve the policy objective (Kaine and Johnson 2004). Again we use the concept of involvement to assess landholders' responses in regard to these criteria.

In this framing, policy instruments that affect the scale of the responses of landholders are those that change the decision making criteria used by landholders to evaluate the benefits of changes to agricultural enterprises, practices and technologies. Policy instruments that affect the rate of the responses of landholders do not change the decision making criteria used by landholders to evaluate the benefits of changes to agricultural enterprises, practices and technologies but reduce the costs of introducing those changes (Kaine and Johnson 2004).

For example, extension reduces the effort the landholder must invest in obtaining the information needed to evaluate a land management change or the effort the landholder must invest in acquiring the skills needed to implement a change to agricultural enterprises, practices or technologies. Evaluating policy instruments on this basis leads to selecting the policy instrument that is most likely to have the affect on both the scope and rate of landholder responses that is needed to achieve the policy objective.

Organisational responses¹⁸

The third stage of the PCF uses the Policy Innovations Framework (Kaine and Higson 2006a; Kaine, Higson, Sandall and Lourey 2006) and the Relationship Choice Framework (Keeble, Kaine and Hunter 2008) to reveal the impacts of the proposed package of policy instruments for the organisations implementing them and what this means for achieving the policy objective.

Policy innovation

The Policy Innovations Framework (Kaine and Higson 2006a; Kaine Higson, Sandall and Lourey 2006) is used to reveal the potential scale of changes in organisational skills, competencies, procedures, policies, structure and culture that the implementation of policy instruments may require (Abernathy and Clark 1985). The proposed policy instruments are initially characterised according to their fundamental elements. This includes their components and fundamental principles. Any policy instruments that the organisations are currently implementing are also characterised according to these fundamental elements. The existing policy instruments and proposed policy instruments are then compared and any changes in the fundamental elements are identified. The nature and degree of these changes are used to determine the type of innovation that the proposed package of instruments will represent for the implementing organisations.

The different types of innovations signal different implications for the organisations in terms of changes in capabilities, processes, structure and culture that may be required to successfully implement the proposed policy instruments. This in turn provides insights into the potential impacts such instruments may have on the successful achievement of the policy objectives.

The following section describes the fundamental elements underpinning the classification of the policy instruments, the four types of innovation that changes in the instruments represents and finally the implications for the organisations implementing the proposed package of instruments.

The fundamental elements of the Policy Innovation Framework that are used to classify a policy instrument are the instrument concept, components, component principles, architecture and architectural principles (see Table A.1). The instrument concept is a generic description of the way that the policy instrument achieves the policy objective. Different policy instruments achieve policy objectives in fundamentally different ways. For example, an incentive program is a generic description of a policy instrument that achieves the policy objective through providing financial assistance for the adoption of prescribed activities.

The individual rules, processes and procedures that form the policy instrument are its components. Each component performs a particular function. For example, the list of prescribed activities is a key component of an incentive program. This list provides a link

¹⁸ The material in this section has drawn heavily from Kaine and Higson (2006), Kaine, Higson, Sandall and Lourey (2006) and Keeble, Kaine and Hunter (2008).

between prescribed landholder behaviours and an environmental outcome. Other components of an incentive program might include funds to allocate to landholders and eligibility rules.

Component principles are the fundamental principles that guide the design and functioning of a component. For example, the principle that prescribed landholder behaviours will contribute to an environmental outcome guides the design and functioning of the list of prescribed activities component of an incentive program. Another component principle of an incentive program might include that a financial reward will promote behaviour that contributes to an environmental outcome. This component principle relates to the funds to allocate component of the incentive program.

The way that the components are arranged or integrated to form the policy instrument is the architecture. As outlined above, the list of prescribed activities, funds to allocate and eligibility rules are components of an incentive program. They are arranged such that funds are awarded based on eligibility rules that are tied to the list of prescribed activities. This arrangement forms the basis of an incentive program and we have termed this architecture reward management.

The architecture is founded on a set of architectural principles. Architectural principles are the fundamental principles that underpin the arrangement and combined functioning of the components that form the policy instrument, i.e. the architecture. Different instrument concepts have different architectures and so are underpinned by different architectural principles.

For example, rewarding landholder contribution to an environmental outcome is a principle that underpins the arrangement and combined functioning of the components (list of prescribed activities, funds to allocate and eligibility rules) that form an incentive program.

Types of policy innovation

The fundamental elements described above provide a basis for classifying changes in policy instruments into four types of policy innovation: incremental, modular, architectural and radical. These four types of policy innovation are distinguished by the dimensions of change the policy innovation introduces to the component principles and architectural principles of the original policy instrument. The dimensions of change represent a continuum with no change at the minimum and major change at the maximum (see Figure A.2).

An incremental policy innovation is a change to a policy instrument that involves only minor change to the component principles and little, if any, change in architectural principles compared to existing instruments. A modular policy innovation is a change to a policy instrument that involves a major change to its component principles with little, if any, change to its architectural principles. This type of policy innovation essentially involves major changes to the components of an existing policy instrument. The implementation of this type of innovation often requires the acquisition of new organisational skills and competencies and the changing of some organisational procedures and processes (Abernathy and Clark 1985).

An architectural policy innovation is a change to a policy instrument that involves major change to its architectural principles but little, if any, change to its component principles. This type of policy innovation essentially involves rearranging the components of an existing instrument. The implementation of this type of innovation often requires changing key organisational procedures and processes and even altering organisational structures (Abernathy and Clark 1985).

A radical policy innovation is a change to a policy instrument that involves major changes to both component principles and architectural principles. As such, it also involves changes to the components and architecture of the existing policy instrument. The implementation of this type of innovation often requires the acquisition of a range of new organisational skills and competencies, major changes to organisational procedures and processes, organisational restructuring and even the modification of organisational cultures (Abernathy and Clark 1985).

In this section we have outlined the Policy Innovation Framework which is used to classify changes in policy instruments into four types of policy innovations: incremental, modular, architectural and radical. These types of policy innovation provide a basis for predicting the intra-organisational implications associated with implementing new policy instruments. In the next section we consider some of the inter-organisational implications that arise with new policy instruments in situations where implementation is shared among organisations.

Table A.1: Fundamental elements of the policy innovation framework

Instrument Concept	A generic description of the way that the policy instrument achieves the policy objective.
Components	The individual rules, processes and procedures that form the policy instrument.
Component Principles	The fundamental principles that guide the design and functioning of a component.
Architecture	The way that the components are arranged or integrated to form the policy instrument.
Architectural Principles	The fundamental principles that underpin the arrangement and combined functioning of the components that form the policy instrument.

Source: Kaine Higson, Sandall and Lourey (2006)

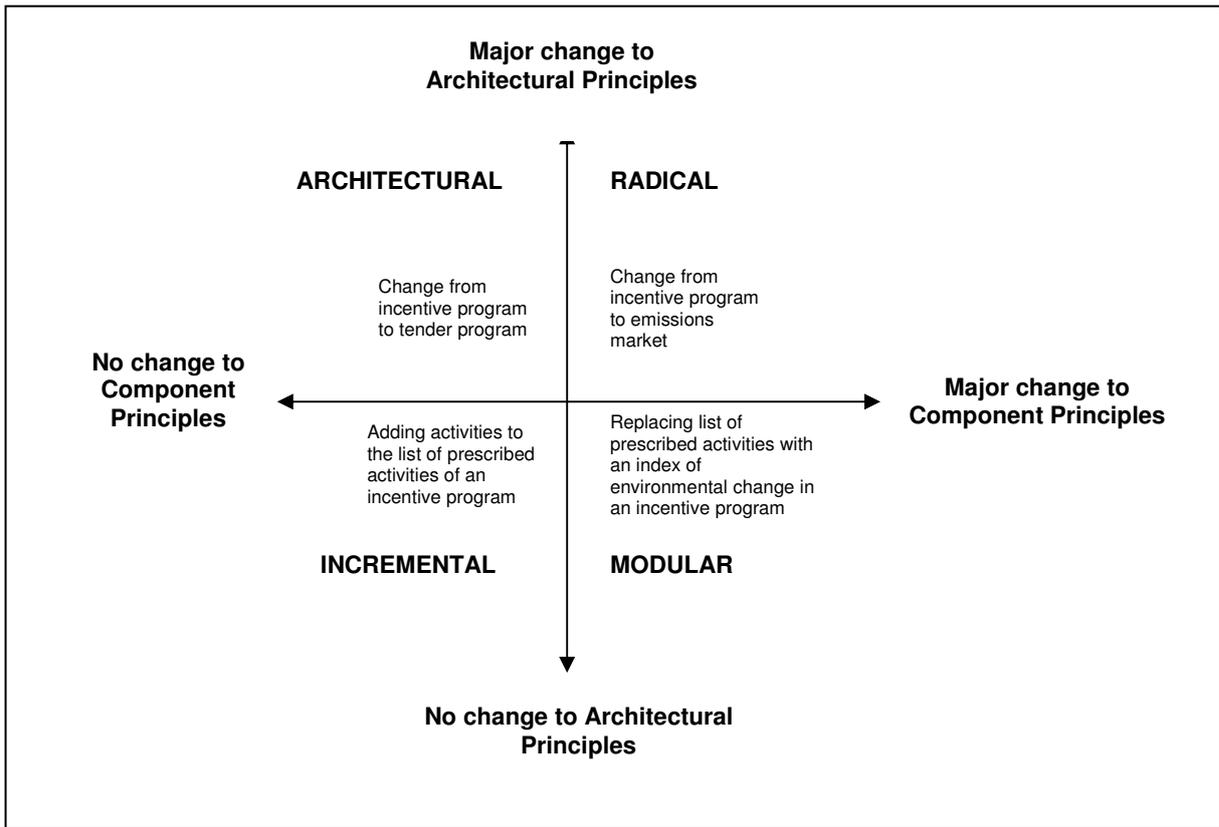


Figure A.2 Types of policy innovations

Source: Adapted from Kaine and Higson (2006) and Kaine Higson, Sandall and Lourey (2006)

Relationship choice

Often the responsibility for developing and implementing policy instruments is shared among organisations. When responsibilities are shared a web of dependencies is created that must be managed if an instrument is to be successfully implemented. The sharing of responsibilities can create tensions among organisations resulting from differences in priorities, differences in sensitivities to unpredictable environments, and differentiated workforces (Kaine and Keeble 2007). This suggests that the management of relationships between organisations has a crucial bearing on whether a policy instrument will be successfully implemented.

The Relationship Choice Framework (Keeble, Kaine and Hunter 2008) is used to reveal the impacts on the interactions between organisations of a proposed package of policy instruments. The framework draws on Hunter's (2004) approach to outsourcing to analyse relationships between organisations on the three dimensions of governance, strategy and workforce management to identify potential issues in the relationships between organisations and suggest possible management measures.

Governance

Governance concerns agreements between organisations as to the rules that will have power over the transactions that occur between them. The type of governance arrangements that will best support the coordinated implementation of policy by two or more organisations depends on the type of transactions that occur between them. A transaction occurs between two parties when they exchange goods or services. Williamson (1996) showed transactions could be classified on three characteristics: how frequently a transaction occurs; how customised the asset investment is to produce the transaction; and the level of uncertainty associated with the transaction being suitable for its proposed purpose (Williamson 1996).

Transactions may be occasional or recurrent. Occasional transactions occur infrequently while recurrent transactions repeat regularly. If a transaction is recurrent, assets devoted to this transaction are considered to be used relatively efficiently because they can be used repeatedly which may result in cost savings for the organisation.

To perform a transaction, organisations allocate their assets to producing goods and services. Assets can include staff, plant and equipment, funds and knowledge. Assets may be standardised, mixed and customised. Standardised assets can be used for a wide range of purposes. Customised assets are used exclusively for a transaction and can only be used for this purpose.

The third characteristic for classifying transactions is the level of uncertainty associated with a transaction. This is important because uncertainty effects the costs an organisation incurs to perform the transaction. If parties to a transaction are unsure at the outset as to precisely what needs to be performed, and what assets will be required, then regular review and revision of the transaction will be necessary. Reviewing and adjusting transactions imposes costs on organisations in terms of time and effort. Williamson

(1979, 1996) believed as uncertainty about the nature of a transaction increased, so did the potential for transactions to create costs and inefficiencies.

The governance of a relationship between two parties is the arrangement or contract that rules the interactions between them. Governance includes rules for the terms of engagement (contractual arrangements) such as how transactions will occur between the parties, the tenure of the relationship between the parties (short or long term), and the management of disputes between them. There are four types of governance relationships: market, trilateral, bilateral and unified relationships (Williamson 1979).

Market governance involves a short-term exchange between parties, the parties remain independent of each other and disputes are dealt with by reference to third parties. Trilateral governance is similar to market governance because it is short-term and disputes are dealt with by a third party, however parties are semi-dependent for an agreed time. Bilateral governance involves long-term exchanges, parties acknowledge their interdependencies, and the responsibility for dispute resolution lies more with the parties involved. Unified governance occurs where the transactions occur entirely within an organisation.

Different types of governance facilitate different types of transactions. Generally, when transactions between organisations are predictable and asset investment is standardised, market and trilateral governance can facilitate low cost exchanges. In contrast, bilateral and unified governance relationships support regular exchanges for customised and uncertain transactions (Williamson 1979). The different types of governance are matched with different types of transactions in Table A.2.

There are some simple rules that guide the choice of governance for transactions. When parties customise their asset investment to perform a transaction there is strong pressure to complete the transaction because the costs incurred cannot be offset by using the investment for other transactions. In these circumstances, governance arrangements that acknowledge this dependency and offer protection by guaranteeing the commitment of the parties to the transaction are most desirable. Hence, trilateral and bilateral governance relationships are the preferred types of governance in these circumstances.

Unpredictable transactions require the parties to constantly adjust their investments. Hence, flexible governance arrangements that support adjustments are desirable when transactions are unpredictable. These circumstances favour the use of bilateral and unified governance.

With standardised transactions the asset investment is less tailored, the nature of the transactions can be precisely specified and transactions require limited flexibility. In these circumstances market governance can facilitate adjustments through prices. Market governance has relatively low transaction costs because the parties do not need to enter negotiations to make adjustments to the transaction.

Table A.2 Types of governance and types of transactions

		ASSET INVESTMENT CHARACTERISTICS		
		NON SPECIFIC all units are the same	MIXED Some tailoring for a given situation	CUSTOMISED Tailored specifically for a given situation
FREQUENCY CHARACTERISTICS	OCCASIONAL	<p>MARKET GOVERNANCE</p> <p>Procedures for annual reporting</p>	<p>TRILATERAL GOVERNANCE</p> <p>Regional land and water management planning</p>	<p>GOVERNANCE</p> <p>Constructing a community drain</p>
	RECURRENT	<p>Monthly monitoring water quality in a river</p>	<p>BILATERAL GOVERNANCE</p> <p>Field days to communicate best farm practice to landholders</p>	<p>UNIFIED GOVERNANCE</p> <p>Develop a program for a regional infrastructure upgrade</p>

Source: Adapted from Keeble and Kaine (2008)

Strategy

The primary purpose of an organisation is to create value for its customers, whether they are public or private. Organisational strategy is the process organisations use to establish how they create value for their customers. Deciding on a strategy involves matching the organisations internal capabilities (resources, assets, funds, competencies) and their external environment (e.g. customer needs, competitors, suppliers, substitutes). The resulting strategy forms a set of principles that direct the way an organisation's activities, structures, processes and resources are configured to maximise the creation of value for customers.

Activities that play an essential role in the way an organisation creates value for customers are vital to organisational success and, generally speaking, should take place within the organisation. When organisations allow such activities to operate externally strategic risks arise because they may lose control of the creation of value and may have restricted access to market intelligence about their customer (Porter 1985).

Organisational activities can be classified into three categories: core, essential and non-core (Porter 1985). Core activities are the main priority for organisations because they are the source of the value the organisation creates for customers. Essential activities are those activities that fundamentally support the creation of value because they are an indispensable input to core activities. Essential activities should be given the same priority as core activities (Hunter 2004). Activities that are not core or essential should be accorded secondary priority because they are not critical to the creation of value by the organisation.

When organisations are jointly responsible for implementing policy, they may be forced to share core activities in the sense that these activities are undertaken either jointly with, or entirely by, other organisations. In these circumstances, organisations must identify the type of risks that come with sharing core activities and formulate management responses to mitigate these strategic risks. These risks include loss of competitive advantage, loss of internal capability, loss of access to market intelligence and loss of control over the consistency, quality and timeliness of products and services delivered by the organisation (Hunter 2004; Kaine and Keeble 2007). Sharing activities also creates costs in relation to coordination, to compromise and inflexibility.

These considerations suggest that when organisations in the public sector are compelled to share, or outsource core or essential activities then there are risks to all the organisations involved. These risks need to be managed. The degree of risk the sharing of activities presents for each organisation depends on the level of consistency among their individual strategies with respect to the creation of value and the role of the shared activity in creating that value (Porter 1985).

Porter (1985) suggests that organisations can choose among four categories of management measures to mitigate the risks associated with the sharing of core and essential activities. The four categories are management structures, management systems, human resource management and conflict management. The purpose of these measures is to reinforce coordination and linkages between organisations to encourage the transfer of intelligence and alignment of priorities.

Management structures can be established to encourage collaboration and coordination between organisations. Examples include establishing inter-divisional taskforces to encourage intelligence sharing, committees focused on customer, product and client information, and the centralising of groups responsible for core activities. Structures such as these would be helpful in situations where core activities are shared in a dynamic environment and intelligence gathering and dissemination is necessary to regularly inform the adjustment of activities to maintain value creation (see Table A.3).

Management systems that link functions across organisations can improve the transfer of information. For example joint strategic planning, budgeting and systems to coordinate delivery. Systems like joint planning assist organisations to establish and maintain alignment in strategic and tactical priorities. Systems such as these would be helpful in situations where core or essential activities are shared in a dynamic environment and quality and timeliness of products and services are critical to creating value (see Table A.3).

There are also human resource strategies which can be used to facilitate cooperation such as staff rotations between organisations to promote the sharing of knowledge among staff across organisations, staff education on the interrelationships between organisations, and cross unit management forums. Systems such as these would be helpful in reducing the risk of losing capability in situations where core or essential activities are shared in a dynamic environment (see Table A.3).

Finally, establishing mechanisms for resolving conflict between organisations is essential in a dynamic environment (Porter 1985).

In conclusion, by characterising shared organisational activities as core, essential or non-core the strategic risks associated with sharing activities can be anticipated.

Human resource management

An organisations workforce is fundamental to their success because employees turn organisational objectives into action (Hunter 2004). When organisations share responsibilities they also share workforces or employees. How employees are managed affects their performance (Legge 2005), thus workforce management approaches can affect organisational performance.

Generally, the management of human resources follows one of two styles - hard or soft (Legge (2005). In the hard style, human resources are viewed largely as a factor of production that can be rationally managed. Legge (2005) notes that the hard style treats human resources as passive with a focus on searching for labour with the appropriate skills at the right price. This style is commonly used when the tasks performed by the workforce are standardised and are routine. In these situations the workforce is usually semi-skilled or low-skilled, and these skills are easily transferred between employees or replaceable by physical assets (e.g. automating production lines). The hard style is suitable where the workforce is considered an input rather than the source of the organisations value. Organisations that use the hard model tend to have a cost minimisation focus towards the workforce.

Table A.3 Strategic classification of organisational activities, risk and management measures

Activities that are shared between organisations	Level of risk associated with sharing core activities	Possible management measures
Core	HIGH	Structure, systems, HR, Conflict resolution
Essential	HIGH	Systems Conflict resolution
Non-core	LOW	Contracting

Source: Adapted from Porter 1985

In contrast, an organisation that uses the soft style treats employees as valuable assets that, through their commitment, adaptability and high quality, are the source of value the organisation creates for its customers (Legge 2005). Typically, a workforce in this situation has specialised knowledge and is highly skilled. Popularly termed knowledge workers, O'Donohue, Sheehan, Hecker and Holland (2007) found this type of worker expects to be treated as an asset to the organisation. The soft style advocates participation, motivation and leadership which are believed to result in human development and improved performance.

Given the presence of a causal relationship between the approaches organisations take to human resource management and their ability realise their organisational objectives, organisations need to match their workforce management style with the characteristics of their workforce to ensure their human resource management is logically consistent with, and supportive of, organisational objectives (Legge 2005).

These considerations suggest that the management style that most suits a workforce can be inferred from the nature of the tasks a workforce is expected to perform and the competencies needed to complete those tasks (see Table A.4). When an organisation relies on a highly skilled workforce to create value for customers the soft style of human resource management is most likely to support performance. When workforce competencies are not critical to the creation of value by the organisation a hard style of human resource management style may be most suitable to achieving the objectives of the organisation.

The choice of human resource management style has two important implications for organisations that are jointly responsible for the development and implementation of natural resource policy. First, there is the potential for the achievement of policy objectives to be hindered by a conflict in styles when managers and staff from different organisations attempt to work in partnership. In these situations there is a need to clarify the role of staff in the joint creation of value for each organisation, and to re-align management styles accordingly.

Second, there may be a propensity to regard the staff of other organisations simply as suppliers of a product or service and, as a consequence, an inclination to believe the hard style of human resource management is the most appropriate style for these staff (Hunter 2004). This will put the successful implementation of policy at risk when external workforces are highly skilled and a critical source of value.

In conclusion, by considering the nature of tasks that employees in shared activities are expected to perform the human resource management style appropriate to those activities can be anticipated.

Conclusion

In this section we have outlined the Relationship Choice Framework which is used to identify the inter-organisational implications that arise with new policy instruments in situations where implementation is shared among organisations. The framework can be used to identify issues in relation to governance, strategy and human resource management and measures for dealing with those issues considered.

Table A.4 Classification of workforce competencies and human resource management style

Competency Characteristics	Workforce management style	Characteristics of Management Style
<ul style="list-style-type: none"> • Skills require the application of knowledge and expertise that is non substitutable • Competencies are critical and specific to the organisation 	<p style="text-align: center;">Soft style (high commitment to staff because they underpin creation of value)</p>	<ul style="list-style-type: none"> • Treat workforce with inclusiveness and trust. • Offer job security, responsibility over design and productivity • Employee development (training and learning opportunities) • Commitment and reciprocity, recognition employee satisfaction important • Autonomy and responsibility for their own productivity
<ul style="list-style-type: none"> • Skills standardised, semi to low skilled • Tasks routine, possibilities for substitution • Competencies are important but not critical to the organisation 	<p style="text-align: center;">Hard style (high commitment to financial performance in which employee is an input)</p>	<ul style="list-style-type: none"> • Treat workforce as a factor of production to be rationally managed, skills at the right price • Incentives to encourage productivity • De-emphasise job security, short term contracts • Use internal labour markets?

Source: Based on Legge (2005) and O'Donohue (2007)

References

- Abernathy, W. and Clark, K.B. 1985, Innovation: Mapping the winds of creative destruction', *Research Policy*, vol. 14, pp. 3-22.
- Dholakia, U. M. 2001, 'A motivational process model of product involvement and consumer risk perception', *European Journal of Marketing*, vol. 35, no. 11/12, pp. 1340-1360.
- Hunter, J. 2004, 'Investigating the complexity of outsourcing decisions: an interpretive approach', Thesis for Doctor of Philosophy, University of New England.
- Kaine, G. and Higson, M. 2006a, *Policy Change as Innovation*, Practice Change Research Working Paper 07/06, Department of Primary Industries, Tatura.
- Kaine, G and Higson, M 2006b, 'Understanding variety in landholders' responses to resource policy', *Australasian Agribusiness Review*, vol. 14, no. Paper 6.
- Kaine, G., Higson, M., Sandall, J. and Lourey, R. 2006, *Policy as an Innovation: Case Studies in Australia and New Zealand*, Practice Change Research 07/06, Department of Primary Industries, Victoria, pp. 1-70.
- Kaine, G. and Johnson, F. 2004, *Applying Marketing Principles to Policy Design and Implementation*, Social Research Working Paper 02/04, AgResearch, Hamilton, New Zealand, pp. 1-18.
- Kaine, G., Johnson, F., Lourey, R., Ford, J., Keeble, B. and Higson, M. 2008, *Approaches to managing nutrient emissions in the Macalister Irrigation District*, Final Report, Practice Change Research' Victorian Government Department of Primary Industries, Tatura
- Kaine, G. and Keeble, B. 2007, 'Organisational Relationships and the Implementation of Natural Resource Policy,' *Our Rural Landscape Project Report*, Department of Primary Industries, Tatura, Victoria.
- Kapferer, J. N. and Laurent, G. 1985, 'Consumer involvement profiles: A new practical approach to consumer involvement', *Journal of Advertising Research*, vol. 25, no. 6, pp. 48-56.
- Keeble, B., Kaine, G. and Hunter, J. 2008, *A new approach to investigating how organisations work collectively to implement natural resource policy: A case study in the implementation of irrigation policy*, Milestone Report for the Goulburn-Broken Catchment Management Authority', Department of Primary Industries, Victoria.
- Legge, K. 2005, *Management work and organisations: human resource management, rhetoric's and realities*, Anniversary Edition, Palgrave Macmillan, New York.
- Mittal, B. and Lee, M. S. 1989, 'A causal model of consumer involvement', *Journal of Economic Psychology*, vol. 10, no. 3, pp. 363-389.
- Murdoch, H., Bewsell, D., Lourey, R. and Kaine, G. 2006, 'Understanding people's response to biosecurity regulation', In *Decision Making in Uncertain Times 3rd*

National Conference on Risk Management, Auckland, 2006, The New Zealand Society for Risk Management Inc.

O'Donohue, W., Sheehan, C, Hecker, R. and Holland, P. 2007, 'The psychological contract of knowledge workers', *Journal of Knowledge Management*, vol. 11, no. 2, pp. 73-82.

Poiesz, T. and de Bont, C. 1995, 'Do we need involvement to understand consumer behavior?' *Advances in Consumer Research*, vol. 22, pp. 448-452.

Porter, M. E. 1985, *Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, New York.

Verbeke, W. and Vackier, I. 2004, 'Profile and effects of consumer involvement in fresh meat', *Meat Science*, vol. 67, no. 1, pp. 159-168.

Williamson, O. 1979, 'Transaction cost economics: the governance of contractual relations', *The Journal of Law and Economics*, vol. 22, no. 2, pp. 233-261.

Williamson, O. 1996, *The mechanisms of governance*, Oxford University Press, New York.

Zaichkowsky, J. L. 1986, 'Conceptualizing involvement', *Journal of Advertising*, vol. 15 no. 2, pp. 4-14.